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BY

DANIEL GREENLEAF THOMPSON

IN TWO VOLUMES

VOL. I.

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THESE VOLUMES

ARE INSCRIBED BY A KINSMAN OF A LATER GENERATION

TO THE ILLUSTRIOUS MEMORY OF

SIR BENJAMIN THOMPSON, COUNT RUMFORD

A PHILOSOPHER, STATESMAN, AND BENEFACTOR OF MANKIND

A GREAT PROPHET

WHO WHILE LIVING WAS NOT WITHOUT HONOUR

SAVE IN HIS OWN COUNTRY

AND UPON WHOM DEAD THAT PRAISE JUSTLY DUE TO

A MERIT ALMOST UNRIVALLED AMONG AMERICAN MEN OF SCIENCE

HAS BEEN BUT TARDILY AND INCOMPLETELY BESTOWED

BOTH BY HIS OWN FAMILY AND HIS COUNTRYMEN AT LARGE

BESIDES the little I myself may have contributed, the reader is indebted for whatever science there is in this book chiefly to four other minds: to JULIUS H. SEELYE, the personal teacher of my youth, who showed me that philosophy is possible and necessary for human welfare, and who inspired me with zeal for philosophising; to JOHN STUART MILL, the ever-influencing though unseen friend of boyhood, youth, and manhood, who with the first-named taught me to love truth above all things else; to HERBERT SPENCER and ALEXANDER BAIN, who with the second of the four have shown me the paths of true knowledge in the department of Psychology.

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Errata.

In addition to some minor typographical and other errors which the reader will readily correct, the following should be noted.

Vol. I., page 74, chap. V., § 2, line 16, *for* 'to us' *read* 'by us.'
" " 395, § 14, line 16, *for* 'nerve-eliminated' *read* 'never eliminated.'
" " 403, line 1, *for* 'local' *read* 'vocal.'
" " 385, line 8, *for* 'familiar' *read* 'fainter.'
" " 429, § 36, line 10, *for* 'mentally' *read* 'mutually.'

PART I.

INTRODUCTION.

'The firmest and noblest ground on which people can live is Truth; the Real with the Real; a ground on which nothing is assumed, but where they speak and think and do what they must, because they are so and not otherwise.'

Ralph Waldo Emerson.

CHAPTER I.

KNOWLEDGE AND SCIENCE.

§ 1. It is not my purpose at the outset to enter upon a thorough examination of the sources and constituents of knowledge, but rather to indicate provisionally what knowledge is, and how from the body of knowledge in general, departments of knowledge are differentiated and organised; to the end of showing more especially the true place and scope of a system of psychology. The more complete treatment of the subject is reserved for a later stage, when it will receive an elucidation not possible at present. But whatever provisional statements are necessary now, will, I trust, be confirmed in the course of subsequent exposition.

§ 2. The words *know* and *knowledge* (*γνῶσις*, *cognitio*) express an experience of sentient beings. The words carry their own meaning better than any explanation of them, because they refer directly to this experience which is ultimate. They imply a *knower*, a something *known*, and a *knowing*. Knowledge is a *knowing* completed and held before the mind in its totality; in other words, it is a result of an act of *knowing*, relating to a *knower* and a thing *known*. Such a result in its unity is called a *cognition*. Knowledge in general is an aggregate of cognitions. The sum of any one's knowledge is the sum of his cognitions; the sum of every one's cognitions is the whole body of knowledge. When we speak of our own individual knowledge we mean the aggregate of cognitions we have; when we speak of knowledge to be acquired we mean cognitions which others have or have had, and new cognitions which we deem possible to be added to them.

§ 3. We may have knowledge without expressing it, but in order that our knowledge may be of any use to others than ourselves, and in order that we may avail ourselves to any extent of the knowledge of others, there must be some sort of expression, and more, some means of preserving expressions. This is accomplished

chiefly by language; and by the use and aid of language the body of knowledge in general is made up of affirmations and denials which symbolise and express cognitions.

§ 4. Cognitions may be either singular or general, and so also may be their expressions. An affirmation may be of an individual thing or it may be of a number of things having common characteristics or attributes. I may say *This tree has branches*, or *Trees have branches*; *John is mortal*, or *Men are mortal*—the first are singular affirmations, the latter general. General affirmations combine into one expression many singular cognitions. They condense and economise the expression of knowledge. It is obvious that if we can by one affirmation cover and express the cognitions expressed in several there is a great gain; if there be a limit to the acquisition of cognitions that limit is much extended by an ability to generalise.

§ 5. The fact that knowledge is expressed and that the expressions come to have a meaning from their usual application, creates the possibility of error in this expression, that error being a want of conformity of the expression to the actual experience. Hence arises truth and falsehood. The word *man*, for instance, has a certain meaning fixed by custom and usage; so has the word *head*. It is possible to say *Men have heads* and *No men have heads*; the former affirmation conforms to experience and is *true*; the latter does not conform to experience and is *false*. So also on seeing a *horse*, I may say *This is a dog*, the words *horse* and *dog* having a certain settled application; yet though I may use the language of that proposition, it is not true, since the words *dog* and *horse* have a definite meaning, and the expression is not an expression of the actual cognition I have. These are only samples of the errors which may arise in expression; we shall have occasion farther on to notice others; but from the possibilities of such errors, and the fact that they actually occur, appears a distinction between the affirmations which express cognitions into *true* and *false*.

§ 6. We cannot properly say, however, that cognitions always are true or false, but only the expressions of cognitions. If we have a cognition we have it, and, unless it is itself a symbolical cognition, truth and falsity would seem to be irrelevant terms to apply to it; but since the mind generalises, in the process of that generalisation there may arise truth or falsehood in the cognition itself. For in order to generalise there must be comparison,

a placing of two things together and a noting of their agreement or difference. The affirmation then made expresses a cognition of the mind which may be true or false. I may cognise an agreement, where there is none, or where the agreement is not sufficiently far reaching to justify the general affirmation I make. A general cognition too may cover so much that I may not be able, without some care, to say with certainty that a new object before me falls under it; yet in the rapid operation of the mind I may cognise that it does, thus creating a false cognition—false because it does not conform to the fact, as a more careful scrutiny will reveal. But notwithstanding cognitions of likeness and difference arising in the process of generalisation may sometimes be called true or false; otherwise, cognitions which do not conform to actual experience are said to be *fictitious*, in contradistinction to those which do and are termed *real*. Into questions of the exact force and definite limitations of these distinctions we need not now enter.

§ 7. When knowledge with reference to any subject is expressed in a generalised form, and its expressions verified, it becomes *scientific*; otherwise it is *unscientific* or *empirical*. That there may be science, there must be some centre of association and generalisation, or some subject of science; then follow the conditions just referred to. A science is knowledge of some subject expressed in general affirmations (or denials), with those affirmations verified. In the ratio that the generalisations are the highest of which the subject is susceptible, and the verifications are complete, the science is a perfect one.

§ 8. Wherever there is a subject of sufficient interest to engross attention and to warrant the collection of data, the generalising of facts known and a careful verification of the expressions of these generalisations, there may be a science. Of course, then, there may be many sciences, and no limit can be put upon the number. Wherever knowledge has the characteristics just stated it has passed from the category of empirical knowledge into that of scientific.[1]

§ 9. The fact that there is a multiplicity of sciences suggests both the desirability and the possibility of a still higher unifica-

[1] See Spencer's *First Principles*, Chap. I.; Bain's *Logic*, Deduction, § 29 ff.; Lewes's *Problems of Life and Mind*, First Series, Part 1, Chap. V.; Locke's *Human Understanding*, Bk. III. Chap. I. It is a difficult matter to find anywhere laid down sharply the differences between simple, scientific, and philosophical knowledge. I have endeavoured to present them as concisely as possible.

tion of knowledge by a process of generalising from the sciences considered themselves as particulars. To ascertain their common features or points of resemblance, their connection with each other, and their proper position relative to each other, would naturally demand a science of sciences expressing their community and relations. Such a science is *Philosophy*, and in philosophy we find the most complete unification of knowledge.

CHAPTER II.

PHILOSOPHY.

§ 1. THE student of every science, if he be earnest in his pursuit, will be continually seeking foundation principles. He will not fail to propose to himself questions which, he conceives, reach to the bottom of the subject that occupies him. Very likely the asking of these questions will develop others penetrating still deeper or having a scope still broader. Perhaps he will become frightened by the extent of the field he has opened and content himself with mere conjecture, or possibly shrink back wholly from thought upon the problems suggested. Perhaps he will without sufficient consideration adopt superficial theories of explanation and then blindly and obstinately adhere to them. But at some stage or other he asks the questions and attempts in some form to ascertain definitely the foundations upon which he stands.

§ 2. For instance, the student of geometry does not advance beyond the threshold before he encounters certain expressions which are termed *axioms*: 'The whole is greater than any part;' 'Things that are equal to the same thing are equal to each other;' 'If equals be added to equals the wholes will be equal.' While an unthinking person will remain satisfied with the explanation that these things are so because they *must* be so, the scientific inquirer is not set at rest. Is it true that they must be so? And if so, why must they be so? Is it not possible that somewhere or at some time the whole may be found less than some part? I may not be able to conceive of such a case, but may not my neighbour? What justification have I for the assumption that my own mind is a fully competent judge of the matter? Who and what am I that judge? Even if I admit the axioms to be

universal and necessary truth, and proceed with their aid to demonstrate a proposition, what warrant have I for supposing that the steps of my demonstration are in any wise to be depended upon? It hardly need be said that the answers to these questions must have reference to the very nature of intelligence itself, and are to be found only in a science more general than geometry, which postulates at the outset what is thus questioned.

§ 3. Again, the physicist dealing with material forces finds himself confronted with the problem, What is this matter whose laws I am seeking? Whence comes this force which is manifested? What is this space with which everything in the external world seems to be involved? Did this universe have beginning and how did it begin? Are these questions and others like them answerable? Perhaps not, but if not we cannot rest till we know why not. The student of physical science is not able to avoid asking them, and till he can give the answers or show that they are unanswerable he has not reached the bottom of his subject. But to obtain the desired explanations, he must go beyond his special science which assumes matter and space and time and force to a more general one which deals with the ultimate constitution of the physical universe.

§ 4. So in the affairs of men with each other similar queries arise in all special sciences. The lawyer searches for the law upon a given point. He finds and cites a decision. By whom is the decision made? By a lawyer like himself, but sitting upon the bench. What gives to that decision weight and authority over his own opinion? Why am I bound to follow or heed it? Why am I held and confined by *any* decision? Why by any court? Why, in fine, has any person or tribunal a right to give law to me? What *is* law? What is right? Obviously, to make adequate reply to these questions, a most profound inquiry is necessitated into the sources and foundation facts of the social state of mankind. That there are right, law and just authority is presupposed by the legal specialist. To explain and justify these presuppositions a more general science is needed.

§ 5. Independently of any special science or art, each human being in ordering his present life, in governing his relations with his fellows, in forecasting his future, daily encounters problems insoluble except so far as a general science comprehending the facts of mind and matter furnishes a key. Problems of expediency and duty, of happiness and blessedness, of morality and religion are

everywhere presenting themselves as ultimate questions, answers to which condition and determine not only our scientific knowledge but also our practical welfare. To attempt to give an exhaustive catalogue of these questions would imply a full knowledge of what are ultimate and what proximate, and require the very science which we have been calling for. The French philosopher Perron gives nine questions which he considers to be ultimate and fundamental in their character:—

'The things about us—

1. Are they?	(Existence)
2. What are they?	(Essence)
3. How are they?	(Mode)
4. By what?	(Causality)
5. Why?	(End)
6. Where?	(Space)
7. When?	(Time)
8. How many?	(Number)
9. In what relations?	(Relation)'

Asking a somewhat similar series of questions with reference to *ourselves* as well as 'the things about us' would give a more complete list. But without essaying now to determine the number of the ultimate questions and precisely what are and what are not ultimate, the foregoing illustrations are sufficient to indicate their nature and scope.

§ 6. Since all our knowledge is either of the things outside of us, 'the things about us,' or of the things relating to our inner or mental experience, and since the sciences, therefore, are either of the material world or the inner world, by some called mental and by some spiritual, the ultimate questions of every science will relate to the ultimate constitution of either matter or mind or both. And taking the sciences as particulars, comparing them and generalising from them and from their conclusions, we shall be led directly up to the ultimate principles of mind and matter common to all sciences and governing all knowledge. Thus a science of sciences will establish principles which are the answers to the ultimate questions, and there appears a still further opportunity and indeed a necessity for philosophy.

§ 7. The office and province of philosophy are thus made clearly apparent. Philosophy is the *scientia scientiarum*. Its function is one of comprehension and colligation, and in it as a

science all sciences find their synthesis and their bond of union. And the principles which express this unity, and connect the sciences with one another, are the answers to the fundamental inquiries respecting the nature of things.

To sum up:—

1. Philosophy as the science of sciences is the colligation and comprehension of all sciences.
2. Philosophy is the most completely unified knowledge.
3. Philosophy is the answer to the ultimate questions of the human mind.[1]

§ 8. The word *philosophy* has had a considerable variety of meanings. It has been made to do duty both in characterising the speculations of German transcendentalists and the experimental physics of the common school. Indeed, a considerable portion of the ordinary educated world has no other ideas called up by the term than assemblages of facts in regard to thermometers and barometers, optical instruments and galvanic batteries, hydraulic rams and steam engines. Or else it means to them baseless fabrics of the imagination of no practical or positive value. Yet the word has latterly become more settled in its use in a direction agreeing with our employment of it. No other name so good can be pressed into service to stand for ultimate knowledge or knowledge of the highest generality. *Science* as distinguished from sciences would inevitably engender confusion, and the misleading associations of *metaphysics* are more numerous than those of *philosophy*.

§ 9. Unquestionably some will say that philosophy has no right whatever to sit in judgment upon the validity of ultimate principles or indeed to propound them. It will doubtless be contended that a direct revelation from God gives the only certain knowledge we possess of the ultimate constitution of the universe and the ultimate duties and obligations of men. Thus a distinction will be drawn between revelation and philosophy to the disparagement of the latter. But unfortunately for the reasonableness of such a discrimination, there is no way in which a revelation can be communicated to mankind except through the channels of human intelligence. If the Lord knew Moses face to face, and spoke to him in an audible voice, Moses must have seen with his eyes, heard with his ears, and apprehended with his intellect. If the

[1] Cf. Schwegler's *Hist. of Phil.* Sec. 1; Morell's *Hist. of Phil.* Intro. Sec. 1 and 3.

Hebrew prophets were inspired with a divine afflatus, yet the inspiration manifested itself only through some faculty of the intellect or emotional nature. And if it be concluded as a fact of human experience that a supernatural power does hold communication with men, the fact of such communication, together with its associations and collaterals, takes its place with other facts of human life to be co-ordinated with them and classified under a system of philosophy itself.

§ 10. Moreover, it must be the human intelligence which determines whence comes this revelation or inspiration, and whether it is in truth what it claims to be. Inasmuch as many have supposed themselves to be conversing with God when it has subsequently appeared that they were talking with men, and inasmuch as many lying prophets have arisen, in addition; there is a necessity that the human intelligence should pass judgment upon the source and character of any claimed supernatural revelation. And surely it is not to be supposed upon any religious ground that the Deity has stultified himself by giving man an intelligence fitted for testing cognitions and detecting falsehood, and at the same time forbidding him to use the same upon the very matters respecting which it would seem of the highest consequence that such intelligence should be used, namely, matters concerning the knowledge of God and man's relations to Him.

§ 11. Indeed, it is quite absurd to hold that revelation explains everything ultimate, to the exclusion of philosophy. Revelation presupposes and assumes the existence of a God, and that there is one must be proved, if at all, extrinsically to revelation, except so far as there may be in the assumed revelation evidence corroborative of what is established outside. To determine whether or not there is a God involves some sort of investigation into the facts of nature and intelligence to see if there is anything in nature to lead up to 'nature's God,' or if there is any faculty or power of intelligence to apprehend or discover a deity. The grounds of the trustworthiness of all intelligence must be investigated, and the meaning of the terms by which we habitually express the attributes and modes of intelligence. Natural laws must be traced as far back as possible with a view to reaching their underlying basic principles. Thus, even granting a verbal revelation, there is need also of a philosophy, and having given such a revelation there still lie beyond it more ultimate questions for philosophy to deal with.

§ 12. Under the guise of piety employed as a mantle by those who decry philosophy and urge that revelation is the source of all light upon ultimate knowledge, there is latent a great danger to social progress as well as to individual liberty. For, note precisely what is meant by making revelation the final dispenser and judge of truth. Revelation is supposed to consist of a body of written language which is transmitted from clergy to laity, through master to disciple. There hence arises a class of interpreters who occupy the position of priests of this revelation. Their reputation and power are greatly enhanced if it can be made to appear that they stand in more favoured relations to the Divine Being than do other men. On the other hand, everything like criticism, scepticism, and philosophising must endanger their position as oracles. Now the assumption of a divine revelation as the ultimate criterion of knowledge amounts simply to granting a monopoly of wisdom and power or sometimes even an infallibility to a favoured class, whose direct interest it is to repress inquiry and profound investigation. If the right of examining and testing the alleged revelation is conceded, revelation ceases to be the ultimate criterion, and its interpreters no longer constitute the court of last resort. Thus elevating revelation above philosophy means nothing other than the aggrandisement of a few and the restraint of general liberty of thought. But repression of liberty of thought is only a step from repression of liberty of action. The tendency of the one is always to pass into the other, and the results carried out create the most intolerable of abuses. How dangerous it is to general freedom to prevent or interfere with free thought and investigation, the history of the hundreds of thousands of lives that have been sacrificed for the sake of liberty ought to have taught men thoroughly.

§ 13. The religionist should not be in too great haste to condemn philosophy, for it may be that philosophy will prepare a place and find a warrant for a belief in what he holds most dear. We need to keep clearly before us that, although it is in philosophy that we must look for answers to the ultimate questions, yet it is not to be implied at all that philosophy will fully solve all the problems stated. It may be the prime office of philosophy to put a limit to human intelligence and teach us that we cannot know the answers to the queries we propose. If such should be the issue the philosopher should not feel disappointment or consider that philosophy has any less dignity or value. It can hardly be

expected of philosophy that it will manufacture mental capacities or endow minds with powers they do not possess. All that it can assume to do is to find out what are the mental powers, their products, and their limits. On the other side, the religionist should not complain, for scientific agnosticism in its candid and truthful statements of what we do not and cannot know may nevertheless postulate a Reality upon which, though unknown or even unknowable, the foundations of religion may rest securely as they have never rested upon the crumbling sands of unverified and unverifiable dogmas.

§ 14. It has now been made sufficiently apparent, I trust, that philosophy is necessary. If science is to have completeness, perfection, and unity, philosophy is indispensable, since the ultimate questions and principles of every science are within the domain of philosophy. If it be worth while to obtain the highest, the widest, and the deepest knowledge, philosophy cannot be ignored or neglected. It would seem superfluous then to argue in favour of its utility. Knowledge is of value just in proportion as it is made scientific, that is generalised and verified; and philosophy is the quintessence of scientific knowledge.

CHAPTER III.

THE FUNDAMENTAL POSTULATES OF SCIENCE.

§ 1. FROM what has gone before it appears that the ground-principles of science are principles of philosophy. The answers to the ultimate questions which arise in connection with a particular science lie only within the scope of philosophy. Hence every science must remain incomplete in form, or assume something, the full scientific relations of which can only be apprehended in a system of philosophy. Indeed, it cannot help making such assumptions, for it postulates them at every step, and without them is not science or knowledge at all. At the beginning of the systematic examination of any subject it is important to know, therefore, what are its fundamental postulates.

§ 2. These postulates are general expressions of facts implied in all knowledge. They should be in the most general form and as few in number as possible, for though there may be many expressions the facts themselves which are taken for granted

at the outset of a science are not numerous. In a science of psychology, which deals to a greater or less extent with the genesis and constitution of knowledge itself, the general postulates of all science appear as provisional assumptions, the warrant and necessity for which will receive some measure of demonstration in the course of exposition. Such will be the case in this work. It is necessary to have a point of beginning and to see what it is necessary to assume at the commencement. But though psychology makes such assumptions, it is able to give all the explanation that can be given respecting what the fundamental postulates of science are and why they are postulated.

THE FUNDAMENTAL ANTITHESIS OF THE EGO AND THE NON-EGO.

§ 3. There is no knowledge of any sort possible without a recognition of the distinction between knower and that which is known, perceiver and that which is perceived, the one thinking and that which is thought, the one feeling and that which is felt. A distinction implied by the mind, wherever there exists any consciousness at all, is a distinction between subject and object. What that distinction is the mind does not apprehend so readily. That it is, is fundamental. *I* see, and I appear other than the things I see. This opposition and mutual exclusion is the first thing to be noted in examining the facts of consciousness. It is a fact implied in the very existence of a thinking power. There is a self, and that which is not self, but other. The first datum of science is—

Knowledge implies and cognises as distinct and mutually exclusive, a self and not self (Ego and Non-Ego) *and manifestations of each.*[1]

§ 4. This implied and postulated distinction between Ego and Non-Ego does not imply or reveal anything as to the substance or essential nature of either or of their substantial identity or difference. The Ego and the Non-Ego may be the same in substance or may be different. Nothing is indicated except a mutually exclusive distinction made in the very first awakening of consciousness, and recognised by every mental state, passion, or action, which occurs subsequently.

§ 5. The Ego implies the Non-Ego, and the Non-Ego the Ego. The names are relative terms, and the things they stand for are

[1] Cf. Bain's *Mental Science*, Intro. Chap. I. p. 1.

related things. We may consider the Non-Ego alone and apart, to be sure, but all the time it is the Ego which is considering. The Ego is considering, but it is considering something; that something is Non-Ego. The two are indissolubly connected. We have no knowledge of any Ego without a Non-Ego, nor of any Non-Ego without an Ego.

§ 6. Though a distinction between Ego and Non-Ego is cognised, and though whether it be a distinction in the seeming or in the substantial reality is not so easy to determine, yet it is quite possible for us to describe the distinguishing characteristics of the two and indicate what it is that enables us to say This is of the Ego, and That is of the Non-Ego. In short, the Ego is I, the Non-Ego is everything else. The distinction cognised is not a distinction between inanimate and animate nature; it is not a distinction even between man and other animate beings: the human body is as much Non-Ego as is the horse or dog we see on the street; my brain is not Ego, but Non-Ego. But there are certain manifestations which indicate the Ego and some which indicate the Non-Ego. These manifestations come to or arise in the Ego, and are the *indicia* which exhibit the two. The two classes of these *indicia* are respectively impressions from without and ideas within, or, as some choose to say, sensations and ideas; the former being distinguishing manifestations of the Non-Ego, the latter of the Ego. These manifestations exist in parallel streams or currents, which, so far as our consciousness goes, are never interrupted. When we close our eyes the sensations of pressure, touch, hearing, and the organic sensations of our bodies remain. Even when we go to sleep, we do not know that we are asleep, nor that we have been asleep, until a recurrence of our sensations by waking. In our ideas also there is no breaking of the stream of which we are conscious; we cannot know when our ideas are all absent. These two streams reciprocally alter their relations to each other, sometimes one being the larger, sometimes the other. In a bodily active state our sensations predominate; in a reflective state our ideas. As one stream widens, the other grows narrow. Moreover, the stream of impressions modifies materially the stream of ideas, but the converse is not the fact in the same degree or in the same sense. Impressions give rise to ideas, but not ideas to corresponding impressions. The sensation of a horse gives rise to an idea of a horse, but not the idea of a horse to the sensation. Sometimes, as in a state of profound reflection, the stream of ideas

is not essentially influenced by the stream of sensations; it may therefore become nearly unaffected by the current of present sensations. In the human body, ideas give rise to sensations; an idea of a pain in a particular part will, if long sustained, often produce an actual pain in that part: this class of facts is the only exception to the rule that ideas do not directly occasion sensations. The antecedents of sensations are thus generally sensations, and the antecedents of ideas sensations or ideas.

§ 7. The examination of these parallel currents of manifestations will inevitably awaken certain inquiries concerning both, which philosophy only can answer, but which may nevertheless be stated. The first is the one already mentioned, relating to the substance of the Ego and the Non-Ego, of which our observation tells us nothing at all. The same is true of their origin. Again, why are these two currents coexistent, continuous and parallel? Could the thinking subject have had, and having had, could it maintain ideas without sensations? Could the stream of ideas exist without the stream of impressions? Once more, how can the manifestations of the one class induce manifestations of the other? How can an idea give rise to a sensation or a sensation to an idea? Questions like these suggest themselves for philosophy to answer—questions of the substance, origin, persistence, and mutual influence upon and relation to each other of these two currents. In order to answer these queries, both currents must be studied, and from both must be obtained the data out of which to construct a philosophy which shall solve the problems. Hence two lines of inquiry open themselves before us. In the one, we follow the stream of impressions, observe, generalise, and verify the facts with respect to the Non-Ego manifestations, though always as apprehended by, distinguished from, and set over against the Ego: in the other we pursue in like manner the stream of ideas, collect, classify, and test data with reference to an Ego, which distinguishes itself from and is set over against the Non-Ego.

§ 8. A difficulty presents itself, however, at the outset. We have seen that the stream of ideas is the peculiar manifestation of the Ego. But these ideas are not Ego; they themselves are Non-Ego: that is, conscious mental experience is still objective, and there is all the while postulated a subject which distinguishes itself from its own products. Therefore, are not these very manifestations of the Ego, manifestations of the Non-Ego, since they *are* Non-Ego? The reply must be that though they are

Non-Ego, they are notwithstanding manifestations of the Ego. They are objective manifestations of a subject (there could be no manifestations of a subject that were not objective); but they are peculiar to the subject, appurtenances of the subject, and of a different class from manifestations which indicate a something other than the subject. Perhaps this illustration will be pertinent. A river whose waters are muddy debouches into a bay whose waters are clear. For a long distance a distinct line separates the river water from the water of the bay. The muddy water is *in* the bay, but *of* the river, and manifests the river, though the river ends at its entrance into the bay. This river may be taken to represent the Ego, the bay the Non-Ego; the river water in the bay defined by the line of colour, the stream of manifestations which we have called ideas; the dark coloured waters the manifestation of the Non-Ego. Strictly speaking, we must include within the Non-Ego, the very manifestations of the Ego, but they maintain still a separate and distinct character. In fine, the import of this confusion is that the mind postulates as beneath its trains of sensations and ideas an underlying something, which it calls *self* (Ego); it also postulates a something outside of and not belonging to self which underlies all things external, and this it calls Not-Self (Non-Ego). To make use of language, whose full meaning we shall have to wait for another chapter to explain, the name Ego denotes this underlying something postulated which is termed self, and connotes certain phenomenal manifestations of it as such, and also the phenomena of a different series as manifestations of a something external believed to underlie them and opposed to self: the name Non-Ego connotes precisely the same things, but denotes the something believed to underlie the external manifestations.

§ 9. Understanding this relation, we can take a position as it were out of and above both streams of phenomena, and, looking down upon both, distinguish and study them. For all we have before us is these phenomena; only through them is to be revealed any underlying something, if such there be. Through them we must get at a substantial reality if there be one. In a study of this sort we fall upon a pair of relative names, which we can also advantageously make use of to express the opposition of these two currents of phenomena. They are based upon the presence of a common property of extension belonging to the phenomena of the external world, and the absence of the same

in the other class. All sensational experiences posit extension: ideas are wholly destitute of this attribute. Hence the former may be called phenomena extended, the latter phenomena unextended. The phenomena of the Ego are equivalent to the phenomena unextended; the phenomena of the Non-Ego to the phenomena extended.[1]

§ 10. To sum up, then, we start out with a fundamental distinction between Ego and Non-Ego, postulating, or assuming provisionally what is a matter of general belief—a something underlying the series of phenomena which we call impressions or sensations, and a something underlying the stream of phenomena we call ideas, the former series being extended, the latter unextended. We also note the curious fact that the very manifestations of the Ego are themselves objective and strictly a part of the Non-Ego.

We make this assumption of an underlying something in each case, not because we are in a condition to show that there is one or that there is not, but simply because the terms we are forced to use imply a general belief in such a substance, and we cannot employ any which do not carry that implication; and furthermore because the mind itself postulates such a substantial reality in every one of its operations. Possibly it may be that an examination of the facts to be investigated will show this to be an assumption without warrant, but nevertheless at the very threshold we are forced to make it and cannot proceed one step without it. Whether there is a substantial reality beneath these phenomena, or either series of them, and if there be one anywhere, what it is, and how far we can know it, are questions which we shall be in a better position to answer, I hope, after we have proceeded further in the course of our examinations.

THE LAW OF CONSISTENCY.

§ 11. In order to have any knowledge, the thing known, the knower, and the relation between them, must remain constant in the mathematical sense. A given experience must stand as a coherent identical experience. If I see X, I must be I, X must be X, and the seeing must be seeing, if there be knowledge at all. Therefore in every cognition there is implied what is expressed in the general phrases A is A, or *Whatever is, is.*

[1] Cf. Bain's *Mental Science*, Intro. Chap. I, p. 1.

§ 12. Such a principle of consistency is necessary too in the expression of cognition. A symbol applied to mark an experience must stand for that experience, and can only express knowledge on the supposition that the experience is constant and the symbol also. Words or names may be wrongly applied and out of this may grow error; but it would be impossible to name anything at all if that which was named had no coherence or continuity, and if the name itself was a variable symbol. Knowledge requires a consistency of the experience A with itself, and likewise of the symbol *a* used to mark it with itself.

§ 13. If *Whatever is, is,* another expression of the same truth is, *A thing cannot at the same time both be and not be,* or *The same thing cannot both be A and Non-A.* This is not a separate cognition from the former, but is another statement of the same cognition. If A be A it is not Non-A; if *I* be *I*, at the same time I am not other than I; if Non-Ego be Non-Ego, it is not at the same time Ego. The two statements are mutually implied in each other; they are the obverse of each other and together make up the Law of Consistency.[1]

THE UNIFORMITY OF NATURE.

§ 14. Knowledge, as expressed, is to a very little degree of the present. It relates to what has been, and on the basis of what has been, to what will be. This is to be observed very conspicuously in the generalised knowledge which constitutes science. If we say *Caterpillars become butterflies or moths,* we mean in a certain number of observed instances caterpillars have become butterflies or moths, and that, under the conditions under which this phenomenon occurred in the past, it will occur again. If I see a tree, put me in the same circumstances once more and I shall again see a tree; if I hear a voice, that voice will be repeated, if the circumstances should recur. Except with respect to present cognition (and not even as to that, as we may hereafter see), we can make no affirmation which does not rest upon the postulate that what has been in the past under the same circumstances will

[1] Cf. Bain's *Logic*, Deduction, Intro 21, 22; Locke's *Human Understanding*, Bk. IV. Chap. I. The principle of Excluded Middle, '*A thing must either be or not be,*' is commonly reckoned as a separate expression of the Law of Consistency and as a primary law of thought; but it is really a principle of logic, a special science, and not a postulate of all science. Though true, its truth relates to logical propositions, and does not further concern science in general.

recur. And, inasmuch as science is made up of general knowledge expressed, and this latter is not the expression of present cognition chiefly, but of past and future, it follows that all scientific knowledge stands upon the foundation of the stability or uniformity of nature. This truth may be expressed thus: *Whatever cognition has been made in the past will recur and be repeated, if the circumstances of the former cognition recur.* I prefer this statement, rather than the ordinary one of the uniformity of nature, for the reason that we are now considering the postulates of knowledge or *cognition*, being occupied rather with the Ego than the Non-Ego. All we postulate at the beginning of this scientific exposition are certain necessary principles implied in cognition, or that form of it we deem scientific, and beyond the application to cognitions we need not go just at present.

§ 15. Of course the 'circumstances' of a cognition imply that there are both co-existent and antecedent circumstances. The repetition of a cognition or experience may depend upon coexistences, or antecedent events, or both. And how far the sameness of circumstances, in a given case, must approach to identity in order that the experience or cognition may recur, is always one of the great problems of science, and indeed such problems in their respective applications and their answers constitute the body of all sciences. But the postulate upon which everything is based is that so far forth as the circumstances are the same, so far forth will there be an identity in the experiences or cognitions.

§ 16. Implied in the above expression of this postulate of uniformity is the other aspect of the same truth which appears in these words: *As circumstances vary, so cognitions vary as respects sameness and difference.* Given changed circumstances, there will be cognitions differing from former cognitions in the ratio that the circumstances have changed. To observe and register these likenesses and differences, and trace and record these variations, to generalise from such observations and exhibit the result, so far as may be possible in general laws, is the office of a science of cognitions.

§ 17. There is also implied a power to know a cognition as a repetition of, and the same with or as different from, another cognition. This power lies at the very foundation of a science of pyschology, and will receive our attention very early. But we are now engaged only in determining the postulates common to all science, and will reserve the exposition of mental powers for the

next part of our work. The thing now to be noted is that every connected body of generalised knowledge assumes that what has been will again be, under the same circumstances; its truth depends upon the uniformity of nature.[1]

THE LAW OF IDENTIFICATION.

§ 18. All knowledge postulates that so far forth as two things are identical (or similar) they may be used interchangeably, and whatever is affirmed of the one may be affirmed of the other. If Alpha is like A and identical with it, they are not two things but one and the same thing, and any declaration made respecting Alpha may be made respecting A. If Alpha is like A but not identical with it, so far forth as they are alike the same predications may be made of both, and one substituted for the other. The essence of sameness or likeness is interchangeability.

§ 19. If two things were absolutely identical they would cease to be two things and would be one thing: hence the law of consistency may be invoked to sustain affirmations made under those circumstances. If they are not absolutely identical, then some of their qualities or attributes must differ, and it is on account of those differences, and solely those differences, that the same affirmations cannot be made of both. So far as the two possess the same qualities, the same affirmations may be made of them. Let *A* and *Alpha* represent two things of which all the qualities of the former are *b*, *c*, *d*, *e*, *f*, and all the qualities of the latter are *b*, *c*, *d*, *e*, *f*, *g*. We say, then, that *A* and *Alpha* are alike in respect to *b*, *c*, *d*, *e*, *f*, but differ by the quality *g*, which belongs to Alpha and not to A. Then as respects *b*, *c*, *d*, *e*, and *f*, the same affirmations may be made of both *A* and *Alpha*; the two are identical, and one may be substituted for the other as the subject of affirmation. It is obvious also that were we to eliminate the quality *g* from *Alpha*, all differences between *Alpha* and *A* would disappear, and they would cease to be recognisable as two things. Hence they differ only by *g*, and as respects *g* the same affirmation cannot be made of both. That is to say, so far forth as *Alpha* and *A* are alike, they constitute one thing, and the two may be used interchangeably as subjects of the affirmation, so far as their like qualities go.

§ 20. If, then, the likenesses of *A* and *Alpha* are ascertained and in connection with *Alpha*, *Aleph* presents itself and is found

[1] Cf. Mill's *Logic*, Bk. III. Chap. III.; Bain's *Logic*, Deduction, Intro. 26–28.

to agree with Alpha in the qualities *a*, *b*, *c*, *d*, *e*; then as respects those qualities it agrees with A also, and is likewise one and the same thing with A. Hence arises the principle or axiom, *Things which are equal to the same thing are equal to each other.*

§ 21. The form in which this postulate can be best expressed for our present purposes is the following:—*Whatever objects of cognition or subjects (in a grammatical sense) of affirmation are alike; so far forth as they are like, they may be substituted the one for the other, or used interchangeably, and whatever is affirmed of the one may be affirmed of the others.* It is evident that such a postulate implies a distinction between the knower and the known, and also that persistence of things, terms and relations which is indicated by the Law of Consistency. It also implies the uniformity of nature, for it assumes both generally that since likenesses have occurred in experience, they will occur again; and, given observed particular likenesses, it postulates with respect to these that under the same circumstances *they* will recur to the mind.

§ 22. Not one step can be taken in the process of generalisation without this principle of identification. For no general affirmation can be made respecting two or more things which does not imply a likeness, and that what is true of the one is true of the other to the extent that they are alike. We make such affirmations of one subject standing for and including many particular ones. If we say, *All cows are herbivorous*, we make the assertion of all objects which agree in the common properties which constitute the *cow*; and having identified an object with another which we have called *cow*, and marked their common qualities, the moment we make a general affirmation covering the two, we assume whatever is affirmed of the one may be affirmed of the other, so far as such common qualities are concerned. And so as we increase the number of particulars:—Whatever is true of a whole class is true of whatever can be brought under that class.

§ 23. If the affirmative form of the Law of Identification is admitted as true, it is also true that:—*Whatever objects of cognition or subjects (in a grammatical sense) of affirmation are different; so far forth as they are different they cannot be used interchangeably, and nothing which is affirmed of the one can be affirmed of the others.* This is not another truth but the obverse of the same truth. I am aware that some might at first thought esteem this statement too broad, for, it might be said, we can affirm of A, that it is different from C, and also of B, that

it is different from C, the two being like affirmations respecting subjects which are different; but the difficulty will be instantly removed by the reflection that by such affirmations we express the cognition of a likeness between A and B, namely, *in that they agree in differing from C.* So the postulate above given is not only not controverted but its truth confirmed by such criticism.[1]

§ 24. The above postulates of science comprise all that are fundamental and implied in every aggregate of scientific knowledge:—hence all that are necessary for us to remark here. They seem to be inherent in knowledge itself. It does not appear practicable to reduce their expression to one law, though they are closely related to each other, and mutually implied. The fundamental antithesis of the Ego and the Non-Ego implies the Law of Consistency, for it postulates that both the Ego and the Non-Ego and their manifestations persist and remain each at one with itself. So also it implies the Uniformity of Nature, since it postulates that such a distinction has been always made, and asserts it as a truth which obtains wherever there is or may be a human consciousness. Also the mutual exclusiveness of the two postulates implies the Law of Identification, for it affirms in the most unmistakable manner the non-interchangeability of Ego and Non-Ego. The Law of Consistency assumes the uniformity of Nature, since a thing cannot be consistent with itself unless it be persistent; and if persistent it must be repeated or repeat itself from moment to moment. That a thing *is* requires the stability of nature as a guaranty. And if it be true that a thing cannot both be and not be, there is assumed a difference between an existent thing and a non-existent thing, and we are at once warned that so far forth as they are different nothing can be affirmed of the one which can be affirmed of the other. The uniformity of nature in its turn implies that whatever is, is, else it could not be repeated. It postulates equally the principle of identification,

[1] Cf. Jevons's *Principles of Science*, Intro. Chap I. Sec. 5; Bain's *Logic*, Deduction, Intro 23-25, Mill's *Logic*, Bk II. Chap. II. I very much prefer naming this postulate the Law of Identification to calling it the Law of the Substitution of Similars. The former is less cumbrous, and seems to express the mental process better It carries us more directly back to that activity of the mind which associates similars and more effectually stamps the law as one explanatory of this process which it is in reality At the same time I am not disposed to deny the service rendered by Prof Jevons in giving prominence to this law under the latter name

for without this we could make no assertion respecting any uniformity, since we cannot say that because B follows A, therefore B will follow A, without assuming that the B of one moment is the same and convertible with the B of successive moments. The implications of the Law of Identification we have already considered. Finally, all these three last laws postulate a knower, a knowing, and a known, for without them there would be no knowledge, and no expressions of knowledge nor laws. All of them are statements of scientific knowledge which a knower has respecting something known.

CHAPTER IV.

THE EXPRESSION OF SCIENCE.[1]

§ 1. SCIENTIFIC knowledge is expressed in language. Language primarily is an expression of thought or feeling by the articulation of the voice, and is the principal means of communication between one mind and another. The medium of intercourse is thus originally speech addressed to the ear. But as a most valuable auxiliary to spoken language, written characters addressed to the eye have come to be employed for recording and perpetuating speech. Communication of one mind with another may take place without any language, either written or spoken, as by gestures, facial expressions, or contortions of the body, or by inarticulate sounds, or by simple touch; but language is the most highly organised means of communication and the most efficient. Indeed, it has been seriously maintained that thought is not possible without language; that it is not alone *an* expression of thought but the *only* expression; that words and thought are even identical. Most commonly, however, and most properly, a

[1] I feel under no small degree of embarrassment in undertaking to give an exposition of the constitution and offices of language. This work has been done so ably and so thoroughly by James Mill, that what may here be written will perhaps seem but an abridgment of his treatise on that subject. Nevertheless I cannot avoid treating the subject of the expression of science, and while in many things I follow James Mill quite closely, the critical student will find, I think, a good many points of difference between my exposition and his. I have endeavoured to present the topic in as condensed a form as possible, pursuing the analysis only so far as necessary for the purposes of this work.

distinction is drawn between thought and language, by which the latter is considered of the highest importance but not absolutely essential to the former.

THE GENESIS OF LANGUAGE.

§ 2. There are various theories of the genesis of language, of which the crudest is that man was created with it, or, more definitely, that the first man who existed had, as given him by the Creator, a fully formed language. No one, however, who has given evidence of having studied philology with any thoroughness ventures to propound such an hypothesis. An examination of the history of existing languages shows that they have been undergoing a constant modification and gradual development from primitive roots or stems, and that there has been a progressus from simplicity to increasing complexity. So far, indeed, it might be said that the argument is in favour of a single and simple language having been given men by the Creator, and the complexity of languages developed from that. But we are led to take sides against such a supposition when the fact appears (as it does) that all the changes which have been made in languages have been the effect of proximate causes having their rise in special needs or in the controlling power of special circumstances leading to the inference that language has been gradually formed as called for by the increasing needs of men in the direction of communication and originally sprang from exceedingly small germs. To be sure, if on general grounds it could be shown that man was created perfect, in possession of all his powers as they now are, there is no improbability in the supposition that he was created with a fully formed language; but, though such might have been the case, all the evidence we have as to the actual state of the case tends to make out the contrary.

§ 3. If language be a growth from original germs, in what manner and in obedience to what laws has this growth proceeded? It may be conceived that spoken and written language did not originate together, and that their respective growths have not been altogether parallel. Spoken language took its rise from attempts to make communication between man and man more perfect, and was probably preceded by or accompanied with gestures. There could hardly have been such a thing as language had only one man existed. There would have been expressions of feeling and

of thought doubtless, but not articulately nor systematically. The necessity or desirability of communication failing to exist, there would have been no occasion for the use of language, which is really a product of the social state. Written language in all likelihood began after some degree of communication had been established between man and man and the value of preserved address of one mind to another had become apparent. The rudest and earliest characters out of which written language grew were pictorial representations, which by their forms and juxtaposition suggested the ideas sought to be represented. *Totem* symbols and hieroglyphics are examples of the earliest attempts at a written language. These were not signs of words, but of ideas. Later on, however, by the use of letters signs of words were invented. To explain the manner of the genesis of written language two or three theories have become prominent. Of course there are no facts to show absolutely that language was formed in one way or another, and the explanations given are only true within various ranges of probability. We shall be placed in a good position to judge of the probabilities in the respective cases, and to draw more correct inferences, if we bear in mind two cardinal facts closely allied, the one being in reality comprehended under the other.

§ 4. The first of these cardinal facts has already been expressed, namely, that language arose to establish a more perfect communication between one mind and another. The second is that words (of which language is made up) were coined not to afford complete descriptions and definitions of objects and ideas, but simply to mark them. There is no necessary connection between an idea or an object and the word used to express it. The former of these facts needs no further comment; but the latter perhaps calls for illustration. My meaning will be readily understood if we take a familiar example: The word *dog* in our language is *canis* in the Latin, *κύων* in the Greek, and *chien* in the French. While there is a general resemblance between the words *κύων*, *canis*, and *chien*, there is none apparent between those three and the word *dog*. The resemblance between the three is readily explicable because of the intimate connection of the languages of southern Europe with each other. The word *dog*, however, comes from a source where community with the peoples of the south could not have subsisted. In the one case there is used a symbol entirely different from that employed in the other.

[illegible] between thought [illegible] of the higher [illegible] the former.

[illegible]

THE GENE[illegible]

§ 2. There are vario[illegible] of which the crudest is [illegible] definitely, that the firs[illegible] Creator, a fully forme[illegible] evidence of havin[illegible] ventures to propo[illegible] history of existi[illegible] going a comp[illegible] primitive ro[illegible] simplicity [illegible] said that [illegible] having [illegible] langu[illegible] agai[illegible] all [illegible]

[illegible] other illustration [illegible] nouns, and a large majority [illegible] on nouns. In fact, it is very [illegible] find a simple word or root that is [illegible] symbol which could be replaced by ten, [illegible] others just as well used as the one in reality [illegible]theless it is not to be supposed that these marks [illegible] things altogether arbitrarily. Many words when [illegible] give a tolerably accurate repetition of the sound [illegible] voice gives forth under some particular emotion. [illegible] fear, wonder, all the emotions prompt to expression [illegible] voice; and words have been coined which are mani[illegible] imitations of such expressions. The simple vowel sounds [illegible] their various modifications lay the foundations for a variety [illegible] interjectional words—the *ohs* and *ahs* of language—which represent with great accuracy the natural effects of emotion in the production of sounds. When names began to be given to things, undoubtedly they were suggested by all sorts of resemblances. Names were given to animals because of the cries they were accustomed to utter, some name like *bow-wow* (as philologists reason) having been the first given to the dog, and *baa* to the sheep. Some names, at any rate, in our own experience, we know to have been so given, as the name *Phœbe* to a bird because of the peculiar cry it utters, and it is reasonable to suppose that among primitive men the simplicity and directness of such a method of nomenclature would commend itself.

In like manner it is esteemed that imitative words came into use from various natural sounds, as the fall of a body to the earth, the rattle of sharp thunder, the soughing of the wind. So also a word that glides smoothly and softly from the tongue

The one cannot be said to be more appropriate than the other; there is no reason intrinsic to the words why *cat* in English might not have been used with equal propriety to designate the animal we know as a *dog*, and, *vice versâ*, none why *felis* might not have been used instead of *canis*, or *chat* for *chien*. The words are symbols or signs of certain objects, and other words would have answered the purpose just as well at the outset, though when a given mark or symbol has been once adopted, of course the inconveniences of change are a strong reason for retaining it.

The particles of a language furnish other illustration of the same fact. So also proper names, pronouns, and a large majority of adjectives, verbs, and common nouns. In fact, it is very seldom the case that we can find a simple word or root that is anything more than a symbol which could be replaced by ten, fifty, or a hundred others just as well used as the one in reality chosen.

§ 5. Nevertheless it is not to be supposed that these marks were put upon things altogether arbitrarily. Many words when pronounced give a tolerably accurate repetition of the sound which the voice gives forth under some particular emotion. Pain, joy, fear, wonder, all the emotions prompt to expression with the voice; and words have been coined which are manifestly imitations of such expressions. The simple vowel sounds with their various modifications lay the foundations for a variety of interjectional words—the *ohs* and *ahs* of language—which represent with great accuracy the natural effects of emotion in the production of sounds. When names began to be given to things, undoubtedly they were suggested by all sorts of resemblances. Names were given to animals because of the cries they were accustomed to utter, some name like *bow-wow* (as philologists reason) having been the first given to the dog, and *baa* to the sheep. Some names, at any rate, in our own experience, we know to have been so given, as the name *Phœbe* to a bird because of the peculiar cry it utters, and it is reasonable to suppose that among primitive men the simplicity and directness of such a method of nomenclature would commend itself.

In like manner it is esteemed that imitative words came into use from various natural sounds, as the fall of a body to the earth, the rattle of sharp thunder, the soughing of the wind. So also a word that glides smoothly and softly from the tongue

would be used to denote something smooth and soft, while heavy, harsh sounding words would be employed to represent anything heavy and harsh. If a stock of foundation words were thus created, it is easy to see how they would be modified readily into all the uses which constitute parts of speech, and how derivatives would be formed from them in vast numbers, and new words from these derivatives, until a language might have been the result. It must be confessed that there is a great deal of *à priori* probability in favour of the onomato-poetic theory of the genesis of language.

§ 6. There are a good many difficulties, however, in the way of substantiating the assertion that language grew originally by the principle of onomatopœia. Language is full of the ruins of words, crushed and beaten and twisted until scarcely any evidence is left of their original form. Words, too, are transfused, welded together, violently sundered—one part left here and another there, until it becomes impossible to trace their course and explain their origin. The silent letters, the prefixes, the suffixes, all bear witness to changes and point to earlier words and forms to which they can give us almost no clue. To be sure, careful examination, research, and study have followed many of them back and made their history tolerably clear; but all such researches have only shown that there is a vast multitude of changes inexplicable, and a still greater number in regard to which we can never say more than that there have been changes, but all evidence save of that bare fact has been obliterated. Hence the impossibility of ever determining with any absolute definiteness how language sprang into being or what was its earliest condition. The primitive words seem to be wholly beyond our reach. But as far back as we can go, we are all the time encountering words that appear to have no onomato-poetic relations, and as we view the changes which have a history and observe them as they are all the time occurring, we see that even though onomatopœia be a probable hypothesis as to the genesis of language, the theory is wholly inadequate to explain its progress in complexity. Relations, resemblances, and diversities, appealing to the eye as well as the ear, in the form and in the meaning of words, enabling written language to increase vastly and greatly enrich spoken, very soon give birth to words elaborated out of existing material, then to others, and so on indefinitely until an immense network is woven, for ever growing, for ever changing with varying needs,

altering customs and habits, new discoveries and increase of knowledge, keeping pace with the development of the race itself. And with these remarks, not attempting to settle the questions of the origin of language or very fully to indicate its progress, we will relegate the subject to the science of philology.[1]

WORDS.

§ 7. Language is made up of words. They are ordinarily divided by grammarians into Parts of Speech, of which eight are generally distinguished—the Noun, or name typical and substantive, as *John*, *horse*, *thing*, *being*; the Adjective, or name added to or qualifying substantives, as *white*, *good*; the Pronoun, a short word used in place of a noun to designate that of which the Noun is the name, as *he*, *who*, *that*; the Verb, a word used for predication or assertion, as *give*, *love*, *am*; the Adverb, a word added to or qualifying a verb, adjective, or other adverb, as *when*, *how*, *where*, *very kindly*, *excellently*; the Conjunction, a word used to connect words and sentences, as *and*, *but*, *although*; the Preposition, a word used also to connect other words and to mark a special relation between them, as *by*, *with*, *from*, *in*; and the Interjection, an exclamation thrown between words and sentences, as *oh*, *alas*. This division is useful, and perhaps necessary for grammatical study, but is not adequate to explain or set forth fully the offices of words.

§ 8. Words are marks put upon external objects and ideas. Ideas are objects also, but for convenience we will in this chapter speak of objects external to the mind simply as *objects* and of objects within the mind as *ideas*. These marks, as has been already shown, are for the purpose both of facilitating and establishing the most perfect communication between minds and for recording and preserving those communications, the record really being a part of the first of these two ends, and contributing to the first. Those marks, classes, and systems of marks which will tend to accomplish these ends more perfectly will grow into use and favour, and devices to abridge and simplify, to save time and speech, will naturally be showing themselves continually.

§ 9. Very early it became necessary (and perhaps it was actually the beginning of language) to set marks upon objects

[1] Cf. Prof. W D. Whitney, Max Müller, and other philological authorities.

apprehended by the senses. A name would be given an object expressive of some sensation caused by that object, as perhaps *bow-wow* to a dog from its bark; or ῥόδον to a rose because it was ἐρυθρόν, red; or *staras* (Sanskrit) to stars, because they were *strewers* of light.[1] Then as men came to observe objects more closely and to analyse them, the multitude of their parts would be discerned and the variety of sensations caused, so that the mark would come to include a congeries of sensations, which it would bind into unity. Words are used as marks of single sensations, and also as marks of clusters or collections of sensations, the unity of which it is desirable to indicate. *Heat* is a name sometimes applied to a single sensation (that is, relatively single), *light* to another, *smoke* to another, *burn* to another. When it is desired to express a unity of these as causing sensations, the word *fire* is adopted which marks a cluster of sensations. These clusters may themselves be united with other clusters by a mark for a cluster of clusters, as *fire, house, tree, ashes*, by the mark *conflagration*. The association of clusters in higher unities by common marks applied to them may be continued indefinitely. It is well to observe, however, that, though the same marks may be used by different persons yet the sensations or objects included will be very different and convey different impressions, in the one case perhaps covering a very wide and in another a very narrow range; but of this more anon.

§ 10. In a similar manner marks are put upon ideas. For the present purpose the term *idea* is used with no attempt at exactness. By it I mean to indicate the products of intellectual operations, in opposition to *objects* external to the mind—products of the Ego activities as opposed to products of the Non-Ego. To a considerable extent the marks put upon ideas are identical with those put upon the sensations which exhibit *objects* to the mind. When we say *tree*, we may indeed mean the sensation itself, the object, or our idea of it. If we say *pain*, the mark may apply either to our actual sensation or our idea of that sensation. When we use the term *dog*, we may refer to an external object occasioning a present sensation; but also the mark is used for our idea of that object—both the idea we have when the object is present and the recollection of the animal when he is away. On the other hand, in a great many instances the marks put upon ideas

[1] Cf. Jas. Mill's *Analysis of the Human Mind*, Chap. IV. Sec. I. and note by Prof. Andrew Findlater.

are not coincident with those put upon sensations or objects. The marks for abstract qualities are given independently of the marks of any external objects. We place the mark *goodness* upon an idea formed by abstracting and generalising; but it is not the mark of any object which affects our senses. As ideas increase in complexity, and the farther we go into the field of ideas formed by the mind's own activities, the less we find marks having identity with marks put upon objects.

§ 11. As we had occasion to notice one mark frequently put upon a group of sensations, so also we may now observe one mark standing for a group of ideas. And these groups are united with other groups into larger groups upon which a common mark is placed. Marks, too, are put upon our ideas of ideas. When we say *Man is a noun*, we put a mark upon our idea of an idea; namely, our idea of man forms a basis, and we consider *a noun* as an idea of that idea considered in a grammatical relation. Thus marks are heaped upon one another, and there is no end to their complications and cumulations.

§ 12. It is obvious what a vast saving of names is effected, both in marking objects and ideas, by ranging them in classes and giving a common mark to a class. Class marks may have other functions than that of economising; but that is the one now especially concerning us, as particularly facilitating the interchange of communication. The following table may aid us both in bringing out more vividly this fact of economy and in showing how the process of unification goes on. The two first of the series below given exhibit the manner in which we proceed to put marks upon objects or sensations, and then upon clusters and groups of them. The others show a like process respecting ideas, and illustrate how the same marks are applied to ideas as to sensations, and also how and where in the increasing complexity of the series the marks cease to coincide with marks of sensations. The last series indicates roughly the process of putting marks upon the most abstract and complex ideas.

I. *Objects or Sensations.*

Brick				
Brick				
Brick	*House*			
Brick	house			
Brick, etc.	house	*Block*		
	house	block	*Street*	
	house, etc.	block, etc.	street	*Town*
			street, etc.	

Horse
Dog
Cat
Fox
Cow, etc. } *Quadruped*
Biped
Myriapod
Apod } Animal.

II. *Ideas.*

Brick
Brick, etc. } *House*
house
house, etc. } *Block*
block, etc. } *Street*
street
street, etc. } *Town*
Town
Town
Fields
Mountains
Rivers, etc. } *Continent*
Continent
Island
Sea } *World*

Man
man } { Gift
Gift } Reciprocity
Debt
Payment } Honesty
Fact
Statement } Truthfulness
Generosity
Self-Denial
Courage, etc. etc. } Virtue.

§ 13. If we had only marks of the character just illustrated, language would be a very cumbrous affair. The device of putting marks upon classes simplifies and economises, but another improvement still further aids expression and to a very great degree. Suppose that we have classes of objects which are alike except in the single item of size, in which there is great variety. It would then be possible for us to give different names for all the different sizes ; we could thus subdivide and mark the subdivisions to an indefinite extent. It need scarcely be observed, however, that such a process would be almost interminable, and the multiplication of marks thereby occasioned extended beyond all computation. As suggesting a method of avoiding this difficulty, it would be noticed that different individuals in a number of classes would have corresponding degrees of size. Thus the thought of making cross-divisions would arise and marks adjective to other marks would be devised and extended throughout the whole domain of markable things. The mark *great*, for instance, would be put upon certain individuals of a vast number of classes, and the word *small* upon certain others, thus economising immensely in the number of marks. So with *height*, occasioning the marks *tall*, *short* ; so with

colour, marked as *red, green, yellow*, etc.; so with *weight*, marked as *heavy, light*, etc.; so with qualities like *good, beautiful, noble, true*, etc.; and so on *ad infinitum*. In applying marks of this character even to a small number of classes, the saving of words is not inconsiderable, and when marks like *great, small, good, bad* are employed as applying in some way or other to nearly all classes, millions on millions are saved.

§ 14. In the progress of development of a complete means of communication between minds there arises occasion not merely to put distinguishing marks upon different objects and ideas, and to place marks upon classes of objects and ideas, but also to make assertions in regard to them. I place a mark upon an object, *horse*; also the same mark upon my idea of that object. I also mark a class to which horse belongs, as quadruped. By including *horse* under *quadruped*, I imply that a *horse is a quadruped* and I have need of some mark to express the assertion. One of the earliest phenomena with which we become acquainted is motion in some form or other, and we require a mark to express not only motion but the moving. We notice two phenomena, *horse* and *motion*. Now we desire to communicate the fact that the *horse* and *motion* are connected, and that the *horse moves*. Hence a series of marks are called into use whose office is predication or assertion. These are generally what the grammarians term *verbs*. These marks are made susceptible of variation to express time of the action, mode or dependence of one action on another, the number of the agents and whether they are the persons speaking, spoken to, or spoken of, and also whether the person of whom the predication is made is acting or acted upon. All these relations are indicated by special marks, which when a science of languages comes to be formed are called *tense, mode, person, number*, and *voice*. And occasion also arises to indicate the mere idea of acting, leaving out all considerations of tense, mode, person, number and voice; and a special mark is put upon such an idea to characterise the *infinitive*, or unrestricted, unlimited part of the verb—*movere*, or, as in our language it is expressed by two marks, *to move*. So likewise assertion is made not only of action or motion, but also of rest or inaction, and marks are used similar in form to those predicating action or motion, and which predicate a state, a *standing* or *remaining*; as we say, *the horse stands* or *lies, the man sits, the earth abides*, and many others. Finally in the verb *to be* we have the most abstract of all the predicative expressions.

§ 15. Another device in the use of marks came into play when adverbs were introduced. By means of this class of marks greater definiteness in communication is effected. Their office is to limit the meaning of words of some classes, to restrict it, qualify it, or modify; as in using the word *great*, we increase the definiteness of the expression when we say *quite great*, or modify its meaning when we say *somewhat great*. They are employed with the parts of speech termed verbs and adjectives, and with other adverbs, and limit or qualify, especially in regard to five classes of particulars: 1. Time; 2. Place; 3. Quantity; 4. Quality; 5. Relation. They are almost always used to take the place of a longer and more circuitous expression. Sometimes they modify not any particular word, but a whole assertion. They are often connective of other words, or of clauses or sentences, their conjunctive being in addition to their adverbial force.

§ 16. Another important class of marks is made to do substitute duty for nouns, namely pronouns. These are used to denote the person speaking, the person spoken to, and the person spoken of, without repeating the names of those persons; also to individualise a certain one of a class, as *this* book, *that* house, etc. And furthermore, they perform the office of connectives, as in the relative *who*; they are used in questions, as the interrogatives, and sometimes indefinitely and distributively, as *any one*, *each*, etc.

§ 17. Two classes of marks are employed specifically as connectives, namely prepositions and conjunctions, while another is used to denote mere exclamations or emotions. Prepositions are marks prefixed to substantive words to connect them with some other words or combinations of words, and to express a variety of relations, among which relations of place are decidedly prominent, as *in the forest*, *from the door*, *to the house*, *near the town*, etc. Conjunctions sometimes connect enumerations of objects or ideas, as the conjunction *and*, but more frequently are used as connecting links between assertions. Interjections are simple marks of utterances under various emotions.

§ 18. From what has preceded, it will be possible to observe the chief ways in which marks have come into use to indicate objects and ideas. These marks are words which perform various offices expressed by the different parts of speech, and which are varied in many ways to express accidents of number, gender, person, position, comparison and relation generally—and these ways are somewhat different in different languages. Variations

are countless, but all look to the same end of perfecting communication. Enough then has perhaps been said to show that words are the *material* of language and to illustrate the manner in which they are made to subserve the ends of language. The word is the unit of language. Starting with words, we are now ready to proceed with a synthesis which will show how, by means of words, thought is communicated and perpetuated.

NAMES.

§ 19. 'A name is a word taken at pleasure to serve for a mark which may raise in our mind a thought like to some thought we had before, and which being pronounced to others may be to them a sign of what thought the speaker had before in his mind.' This definition of Hobbes, 'of a name as a word (or set of words) serving the double purpose of a mark to recall to ourselves the likeness of a former thought, and a sign to make it known to others,' appears to John Stuart Mill 'unexceptionable.'[1] 'Names,' says the latter, 'indeed do much more than this; but whatever else they do grows out of and is the result of this.' Mill's parenthetical interpolation, by which he corrects Hobbes's definition so as to make a name cover not merely one word, but a set of words, is important in order to distinguish names from words. But, even with this correction, the definition is not wholly satisfactory, if for no other reason, at any rate because it does not indicate clearly that names may be and are names of objects as well as of ideas. Mill remedies the difficulty by proceeding at once to answer (and affirmatively) the question whether names are names of things. But I think we shall arrive at a better understanding of the nature of names and naming by considering the two prime, and perhaps the sole, offices of names, to wit appellation and predication. *First*, anything which is a complete appellation of either an object, sensation, or idea is a name; as *dog*, *a large dog*, *an immensely large dog*, *the dog I saw yesterday at the corner of Broadway and Fulton Street*, *the Newfoundland dog which saved Mr. Price's child from drowning*. Each one of these appellations is a name, the last containing as many as ten distinct words; the appellation, however, is not complete, and the idea is not expressed until all are used. Sometimes a name occupies several lines of poetry or prose, and

[1] *Logic*, Bk. I Chap. II.

yet is only a single name. It may be objected that in the last example *dog* is obviously a complete appellation of a dog, and hence is one name, while the other words make other names; but such an objection is easily met. True, *dog* is a complete appellation of an object *dog* or an idea *dog*, but that is a different idea from the one above expressed, the latter being not a dog, or any dog, but *the Newfoundland dog which saved Mr. Price's child from drowning.* All these ten words are parts of the appellation of the idea in mind, and are necessary to its complete expression. In the first example *dog* is a complete appellation.

Secondly, whatever is a complete predication is a name, as in the expressions, *John gives*, *John is good*, *John is a good boy*, *John gives me a book*, *John very often gives his playmates apples.* In these examples, respectively, *gives*, *is good*, *a good boy*, *gives me a book*, *very often gives his playmates apples*, are each of them distinct names. In the phrase *John is good*, the force of the name resides in *good*, while *is* stands merely as a copula; but the name is not complete without *is*, since the latter is necessary to complete the predication; *good* standing alone is not a name.

§ 20. Observing then that names are either complete appellations or complete predications, it becomes evident that while a word may be a name, it is not necessarily so, but may be only a part of a name. Any word which standing alone is capable of being made the subject or predicate of a proposition is a name; all other words are auxiliary, adjunctive, and expletive to names. The parts of speech known as particles, that is prepositions, conjunctions, interjections, and adverbs, are of this character, as are also the inflected cases of nouns, and also words used adjectively; as *of*, *with*, *and*, *although*, *since*, *hail! aha! him*, *hominis*, *regi*, *the*, *a*, *la*, *les*, *good*, *useful*, *facilis*, etc. Many words, however, which are of the same form as certain adjectives are substantives, and used as complete appellations. Such words are in themselves categorematic and are names; as, *My better is to follow me; White is agreeable to me, but black is not.* Grammarians would explain the words *better* and *white* in these sentences as adjectives used substantively or as agreeing with a noun understood. This means merely that the words are usually adjectives or that generally they would be employed with some other word to mark an object or idea; but the fact remains that here and in similar connections

they are themselves the whole appellation. J. S. Mill[1] speaks of an adjective as capable of standing by itself as the predicate of a proposition, as *Snow is white.* This does not seem to me to be strictly correct. There is no *vis prædicandi* in the adjective itself; that, rather, lies in the copula. The special meaning of the predication resides, of course, in the adjective, but unless the copula be present there is no assertion. The class mark *white*, indeed, calls attention to the fact that *snow* is included under it; by the use of this adjective we are enabled to make an assertion, but it is not itself the assertion. The predication must be *is white* and not *white* alone; the copula must be considered as an inseparable part of the predicate. In inflected words the form of one word expresses all that is conveyed by an adjective and a copula, and no division is even attempted by analysis to separate and leave out of the predicate a copula.

§ 21. Considering names then to be distinguished in their use as appellations or predications, we are prepared to note some other important divisions, according to signification. And first, names may be divided into *General Names* and *Individual* or *Singular Names.* A general name one is which may serve as an appellation (or predication) of an indefinite number of objects or ideas, of each of which the name may be predicated in the same sense. As opposed to such, an individual or singular name is the name of a single individual. *Man* is a general name, while *John* is an individual name. *Tree, horse, animal, persons who earn their livelihood by manual labour, the legislature of a nation* are each general names. It will readily be seen that proper names never can be general names so long as they remain proper, for the distinguishing characteristic of a proper name is that it is the name of an individual. Also that while collective names for the most part are general names, they are not always so: *The legislature of New York* is a collective name, but not general, since it cannot be affirmed of more than one individual; *legislature*, however, is a collective and a general name as well, since there are many legislatures. From such examples as this last it appears, therefore, that many general names become individual by having attached to them words that limit, make definite, and particularise. Many of the uses and functions of general names will become evident to the reader from time to time as we go on, now that attention has been called to their character.

[1] *Logic*, Bk. I. Chap. II.

§ 22. The scholastic philosophers recognised another valuable distinction between names, that between *Abstract* and *Concrete.* A concrete name is the name of an object as its exists in nature invested with its attributes and qualities; an abstract name is the name of an attribute or quality drawn away and considered separately from its object. *Goodness*, *hardness*, *pride*, *frailty* are abstract names; *A good man*, *hard stone*, *a proud disposition*, *a frail character* are concrete names, as also simpler names, like *John*, *house*, *dog*. Abstract names when first applied are singular, afterwards they become general names, since they may each be predicated in the same sense of a number of individual instances embracing countless varieties: *goodness* is a general name for many specific or individual ideas of *goodness*, formed as there have been occasions to make the abstraction; the first time abstraction took place and the resultant idea was named *goodness*, that name was the name of an individual idea. This will appear more fully when we come to examine the ideas themselves which are thus marked respectively by abstract and concrete, general and singular names. Concrete names are either general or singular according to their application: *A good man* is a general name, while *John* is a singular name; but both of them are concrete. Care should always be taken, however, not to confound abstract names as such with general names; for though abstract names may be general they are not intrinsically so, and all general names are not abstract. Says Bailey: 'By abstract terms, which should be carefully distinguished from general names, I mean those which do not designate any object or event, or any class of objects or events, but an attribute or quality belonging to them; and which are capable of standing grammatically detached without being joined to other terms; such as the words *roundness*, *swiftness*, *length*, *innocence*, *equity*, *health*, *whiteness*.' [1] Dr. Whately says: 'It is unfortunate that some writers have introduced the fashion of calling all *common* terms *abstract* terms.' [2]

§ 23. Names are also *Connotative* and *Non-Connotative.* A connotative name is one which, besides denoting some object, connotes (notes with it) some attribute or quality, or idea, by implication. A non-connotative name is the name of an attribute of an object, or of the object itself, and implies nothing more. Thus *John*, *goodness* are respectively names of object and attribute,

[1] *Letters on the Philosophy of the Human Mind*, p. 195.
[2] See also *Logic*, J. S. Mill, Bk. I. Chap. II. Sec. 5.

and are (speaking broadly) non-connotative; while *man* and *a good man* imply all the attributes associated with manhood, and the latter implies the attribute *goodness*; they hence are connotative names. The name *A good man*, so far as the word *good* is concerned, connotes the existence of goodness as belonging to him. General names are connotative. There could be no name of a class that was not connotative, for to say that there could be would be to declare that a class name has no meaning at all, since the essence of a class name is its denotation of a class, and carrying along with this denotation the various common attributes and qualities of the individuals making up the class. We saw that words were merely marks put upon objects or ideas, and not full descriptions or definitions. These marks are the denotations of objects and ideas, while around those marking words have grown up innumerable special meanings and associations which are all implied when the word is used. These latter are the connotations of the word; and the more general the name the wider is the field of connotations, because it includes the meanings and ideas associated with a greater variety and a larger number of individuals. That concrete general names are connotative is obvious to every one: for instance, how multifold are the connotations of the word *man*! All that belongs to man and characterises him, form of body, mind and mental traits of whatever kind, degree, or description, power of speech—all are connoted as a part of the meaning. But that abstract names may be connotative is not so apparent, though that such is the fact may readily be seen upon reflection. Abstract names are names of attributes, and attributes may have attributes ascribed to them; these attributes of attributes may be connoted by a name. *Common sense* is the name of an attribute, but this attribute has its own attributes of the qualities which with it and other attributes form a higher attribute, as *intelligence* perhaps; and these attributes are connoted by the term. The word *goodness* before cited might in this way be said to connote *virtue*. John Stuart Mill cites the word *fault* as another example of an abstract connotative name, the word being applicable to many attributes and connoting *hurtfulness*, an attribute of those numerous and various attributes. 'When, for example, we say that slowness in a horse is a fault, we do not mean that the slow movement, the actual change of place of the slow horse, has any mischievous effects, but that the property or peculiarity of the horse from which it derives

that name, the quality of being a slow mover, is an undesirable peculiarity.'[1] The sum and substance of what can be said on the subject of the connotation of abstract names is that the latter, so far forth as they become or are used as *general* names, are connotative; otherwise non-connotative. Any mark (or set of marks) which is merely the name of an individual without the implication of any qualities common to that individual with some other is non-connotative. How abstract names may have such associations and implications has been seen and will appear still further in the body of this work. In like manner even concrete individual names have general uses and implications and may become connotative. The *Legislature of New York* (before cited as an illustration) is an individual concrete name and yet connotative, implying the attributes of a legislature in general or of other legislatures which are applicable to the New York legislature, as organisation, method of proceeding, etc. Among the abstract individual names *rose-colour* may be cited as connotative, implying various attributes, as softness, or agreeableness to the eye. But in all these cases it is the general name found in the designation or the general notion involved with the name, from which the connotation proceeds. We may repeat—so far forth as names are general, they are connotative; so far forth as they are singular or individual, they are non-connotative.[2]

§ 24. A further division of names is into *Relative* and *Non-Relative*. A relative name is one which implies or is indissolubly connected with some other name of which it is the complement or supplement, as it were. A non-relative name is one destitute of such peculiarity. *Father and child*, *master and servant*, *right and left*, *finite* and *infinite*, *brother*, *etc.*, are all words which are or may form parts of relative names. The distinguishing peculiarity of a relative name is that it implies a correlative: thus *father* implies *son* and the converse; *finite* implies *infinite*; *brother* implies a correlative *brother*, and so on. Relative names are both concrete and abstract: of the former class we may instance *brother*, *father*, *east and west*, *equal and unequal*; of the latter *likeness and unlikeness*, *paternity and filiation*, *friendship and hostility*. Relative names also are, like others, general or singular, connotative or non-connotative; that is to say, the fact of their being relative or non-relative does not affect their

[1] *Logic*, Bk. I. Chap. II. Sec. 5.
[2] Cf. Bain's *Logic*, Deduction, Bk. I. Chap. I.

connection with these other classes. The connotation of each one of a pair of relative names comprises precisely the same set of facts which by means of the relative terms are merely viewed in different lights or under different aspects. In the example *debtor and creditor*, the name debtor implies that A (the debtor) owes B (the creditor) money, and conversely that B has a claim on A for money due. Now when we come to examine the connotation of the second name *creditor* we find it to be precisely the same, the only difference being that in the one case the same facts are regarded as attributes of A and in the other as attributes of B; that is to say, one of the parties to the relation is *de*noted by the name *creditor*, the other party by the name *debtor*. 'A name then is said to be relative when, over and above the object which it denotes, it implies in its signification the existence of another object also deriving a denomination from the same fact which is the ground of the first name.'[1]

§ 25. Among relative names may be included *privatives*, which are names signifying the absence of something usually present and suggesting names that denote such presence. *Darkness*, *silence*, *ignorance*, *absent*, *nothing*, *empty* are all privative terms. It is remarked by James Mill that all names might have corresponding privatives. Most names imply the presence or existence of the object named, but where it becomes a matter of importance to indicate the absence of the object, privative names come into use and are not otherwise employed. Thus the absence of light is a common matter of experience, and it is important that we have some word to indicate its absence; hence the privative name *darkness* was adopted. Similarly the absence of sound gave rise to the term *silence*, the absence of *knowledge* to the term *ignorance*, and so forth.

§ 26. Names are further *Positive and Negative*; as *A man speaking*, and *a man not speaking*, *Ego and Non-Ego*, *connotative and non-connotative*, *gives me a house* and *does not give me a house*. Negative names can be created corresponding to any positive name; but positive and negative names are not here classed as relative, because they do not invariably suggest a correlative; *A man speaking* does not to complete the idea evoke the thought *A man not speaking*. A negative name, however, would seem always to imply a correlative positive. Indeed, positive and negative names may be regarded as in a wide sense

[1] J. S. Mill, *Logic*, Bk. I. Chap. II. Sec. 7.

relative, though not as expressing a particular and special relationship between two objects and ideas like that expressed by those names we have called relative, but rather the relativity of all knowledge.[1]

§ 27. In our classification of names thus far we have had a more especial regard for names as appellatives, and the divisions noted seem to have a more obvious application to appellations. But the same distinctions may be applied to predicative names as well. The latter may be general or individual: thus *is cold*, *gives*, *will burn*, *are large*, *was welcome to me* are general names, since they may be asserted of an indefinite number of grammatical subjects in the same sense. On the other hand, *is omnipresent*, *is the First Cause*, *was born the first son of Charles and Mary* are individual names, since they can be predicated of only one individual. So also, as *long* is concrete, and *length* abstract; *is long* is concrete, and *is its length* is abstract. Likewise predicative names are connotative and non-connotative, relative and non-relative, positive and negative; for any word or set of words of these classes, or any of them, capable of becoming a complete appellation, can be predicated also, but in its predication does not change its character as a name belonging to its particular

[1] I do not go into all the delicate questions of the use and force of relative, privative, positive, and negative names, because to solve those questions involves a reference to the thoughts of which these names are the marks, and whose development can only be understood after or in connection with a study of the laws of thought. What I give is enough to indicate to the reader the general applications of language as preparatory to but not as superseding a study of those things which language symbolises. The reader is recommended, after completing this whole work, to go over carefully the portions of James Mill's *Analysis* relating to names and terms, also to read similar portions of J. S. Mill's *Logic*, of Prof. Bain's *Logic*, and of Prof. De Morgan's, the gist of whose work, however, on this subject is well stated in Prof. Bain's *Logic*. The point I wish to make here is that psychology is after all necessary to a full explanation of the force and use of language, though some general knowledge of the structure and value of the latter is a necessary preparation for psychology. For instance, it is well for us to know what connotative and non-connotative names are at the very threshold of our temple of science; but the meaning of those terms is governed by and can only be fully apprehended by knowing the meaning of extension and intension of concepts and abstracts. To be sure one may follow the analysis of language, as James Mill did, so far as to be led into the profoundest psychological problems, and to solve them in connection with such an analysis; but this does not seem to me to be the wisest course to pursue; it diverts attention too much from the things for which language stands to language itself, and invests the latter with a superior importance which does not belong to it. Language should always be subordinated to the objects and ideas which it was invented to mark.

divisions. This is very easily seen where the name in predication is the copula and a noun or adjective. Where the name predicative is one or more inflected verbs, its assignment to the classes just marked out may not be so easy a matter, and the relevancy of the classification may not be so apparent, but analysis of the verbs and their resolution into equivalent phrases consisting of a participle and copula will almost always remove the difficulty where there is any necessity of making use of the classification at all.

§ 28. Names, therefore (to recapitulate), may be ranged in classes according to six methods of division. They may be—

Appellative or Predicative.
General or Individual.
Concrete or Abstract.
Connotative or Non-Connotative.
Relative or Non-Relative.
Positive or Negative.

As it is the province of grammar to treat of words, so it is the province of logic to deal with the structure and import of names. Having here to this extent examined their nature and fundamental uses, we are now ready to take another step forward in our survey of language.

PROPOSITIONS.

§ 29. A proposition, said Aristotle, is a speech wherein one thing is affirmed or denied of another. This definition cannot easily be bettered. Professor Bain observes that what in logic is called a proposition, is denominated in grammar a sentence, but a sentence does not quite correspond to a proposition; the latter is generic, the former specific. *That boy of whose peculiarities you speak is John whom I know well*—forms in no view more than one sentence, but in one view may be said to contain three propositions, namely, *that boy is John*, *of whose peculiarities you speak*, *whom I know well.* Grammarians have had much trouble over definitions of the sentence. Perhaps the most common is *a thought expressed in words*, but this is obviously faulty. *A good man* is a thought expressed in words, but is not a sentence. Perhaps if we were to define the latter as a complete independent predication, we should come nearer an accurate and appropriate definition. Our inquiry, however, does not have to do with sentences, but propositions, and to these we will devote ourselves.

§ 30. A proposition consists of at least two names—an appellation and a predication; as *John walks*, or *John is walking*. One of these names constitutes the subject, and the other the predicate of the proposition. Some consider the essential parts of a proposition to be three, *the subject*, *the predicate*, and *the copula*; but I am unable to see any advantage in thus elevating the copula to the rank of a separate and independent part of a proposition. It seems to me to be only a modification of a name for the purpose of expressing predication. From an appellation a name becomes a predication by one of two kinds of modification; either by a peculiar inflection of a word, or by associating with a word a mark which is called a copula. Whether this mark coalesces with the word so as to form one, or is separated so as to form with it two, is a matter of indifference; in either case it is only a variation of the form of the name and inseparable from the predicate. It is an essential part of the predicate, but not a distinct and independent part of the proposition. That of which the assertion is made is the grammatical subject; that which is asserted is the predicate: these two are the terms of the proposition. If we desire for any purpose we may divide the predicate into the *attribute* and the *copula*; but this is a subordinate division of the proposition.

§ 31. The definition of a proposition suggests the first division of propositions, namely, into *Affirmative* and *Negative*. Negation is effected principally by the negative adverb *not*, and the adjective *no*; it is also accomplished indirectly by the prefixes *in*, *un*, *dis*, the suffix *less*, by certain phrases and by various circumlocutions. *John does not give*, *no man gave*, *he is unintelligent*, *he is disinclined to go*, *few will see the day*, are all in effect negative propositions.

§ 32. In their form propositions are sometimes classed as *Declarative*, *Interrogative*, *Imperative*, and *Exclamatory*. A declarative proposition has the form of an assertion, either affirmative or negative; as *John gives*, *John does not give*. An interrogative proposition has the form of a question, as *What does John give?* An imperative proposition has the form of a command, exhortation, or entreaty, as *Give me the book*, *Go thou and do likewise*. An exclamatory proposition has the form of an exclamation, as *Great is Diana of the Ephesians!* These are the ordinary grammatical divisions of sentences, and it is often convenient to make use of them. I have said the division is one according to

form, since the distinctions sought are accomplished solely through changes in the form. Indeed, propositions in any one of the others may be reduced to the declarative form. *Great is Diana of the Ephesians* is an assertion that *Diana of the Ephesians is great*, with a variation of form to add emphasis, express admiration or reverence. *Give me the book* is equivalent to *I desire you to give me the book*, or *I command you to give me the book*, the imperative form merely expressing this desire or command. The interrogative *What does John give?* is a variation from *that which John gives.* Interrogatives may be very properly considered as several assertions abbreviated into one expression, as in the question just stated: *What does John give?* equals—*I think John gives something, I believe you know that which he gives, I desire you to tell me.*

§ 33. Propositions are further divided into *Simple, Compound*, and *Complex*. A simple proposition is one having a single subject and a single predicate, as *The boy walks.* A compound proposition is one consisting of several independent propositions consolidated by an ellipsis of one or more subjects or predicates, or both; thus, *John and James walk* is a compound proposition consisting of two independent propositions, *John walks and James walks*, consolidated by an ellipsis of one predicate *walks*. In *John walks and runs*, the subject *John* is once left out. In *John and Charles walk and run* we have really four propositions, viz. *John walks, John runs, Charles walks and Charles runs. John walks and James walks*, and also *John walks and John runs* would each fail of being compound propositions, but would be two sentences, each containing two simple propositions. Two simple propositions connected by a conjunction do not make a compound proposition; it is necessary that there be an ellipsis of one of the characters just stated. On the other hand, a complex proposition is an independent proposition whose subject is a proposition, or whose meaning is limited, or modified, by a dependent proposition, or both; as, *I will go when he comes; He is esteemed because he is prudent; I know where he has gone; If he commands me I will do it; Honesty is the best policy is a trite but true maxim.* This last is a class of propositions in which the idea to be expressed is not contained in one of the simple propositions or in the other; but in both and in the relation of each to the other. In this class the subject or predicate, or both, is made up of many-worded names, as in the first example the

subject *I* is a single-worded name, but the reverse is the case with the predicate *will-go-when-he-comes*. In the following example we have two many-worded names and also an illustration of a proposition as a subject of a proposition, namely, *That-he-is-a-soldier is-evident-from-his-bearing*.

Both complex and compound propositions, as well as simple, are often grammatical sentences, but are likewise often parts only of sentences.

§ 34. Propositions are also *Categorical* and *Hypothetical*. Categorical propositions declare something absolutely, as *He walked down town yesterday, I know why he said it, I will ask where he went, John and James are brothers*. Hypothetical propositions are those in which the assertion is made dependent upon a condition, as, *If John goes I will go, Either John will go or I will go, James would have done it if he had not been prevented.* Categorical propositions are subdivided into *pure* and *modal*, which division also may sometimes be extended to hypotheticals. Pure categoricals assert simply and without qualification the predicate of the subject, affirmatively or negatively, as, *John goes, John does not go*. Modals are those in which the predicate has a qualification of probability, possibility, manner, and the like; as *John may possibly go, John probably will retire.*

Hypothetical propositions have been divided into *conditional* and *disjunctive.* In the above examples, *If John goes I will go* is a conditional proposition, while *Either John will go or I will go* is disjunctive. This, however, is a distinction without any essential difference, for all disjunctive propositions may be reduced to the conditional form. *Either John will go or I will go* is but a condensation of the four propositions; *If John goes I will not go, If John does not go I will go, If I go John will not go, If I do not go John will go.* The word *conditional* is often used in this connection synonymously with *hypothetical.* Hypothetical propositions are not materially different from those complex propositions wherein a proposition is the subject of a proposition. In the proposition already frequently used as an illustration, *If John goes I will go*, the predication made is not contained in either of the two simple propositions, but in both. The entire proposition means this: *That I will go is a consequence from John going.* The proposition *James would have done it if he had not been prevented* can be resolved into this: *That James would have done it is a proper consequence to be inferred from the supposed*

fact (which is contrary to the reality) that he was not prevented. All hypothetical propositions are abbreviations of the character thus indicated.

§ 35. A fourth general division of propositions is into *Universal* and *Particular*; as *All men are mortal*, *All dogs are quadrupeds*, *Every event has a cause*, *Poisons are injurious*, *No event is without a cause*, *I am the man*, *John is good*—are examples of universal propositions; while *Some men are mortal*, *Some dogs are intelligent*, *Most men are selfish* are examples of particular propositions. It will thus be seen that universal propositions are those in which the predicate is asserted of the subject in the latter's whole extent, or in every instance, while particular propositions are those in which the predicate is asserted only of some of the things that the subject denotes. Universal propositions are usually marked by the adjectives *all* and *every* applied to the subject, while particular propositions are indicated by the adjective *some*. This method of indication does not, however, always obtain. Propositions are often understood to be universal or particular without any explicit declaration: *Horses have legs* would be understood as being universal, while *Horses are ugly* would probably be regarded as particular. So in the example above given *Poisons are injurious* would be taken universally. In a case of predication of an individual the proposition is known as universal without any explicit declaration. In the proposition *John is good* it is clearly evident that the assertion is made of John as a complete individual, and not of a part of John. Propositions in which the assertion is made of an individual have been termed *Singular*, while those in which it does not appear expressly in definite words whether the proposition is universal or particular have been termed *Indefinite* or *Ambiguous*. In universal propositions the subject is taken distributively, that is, taken of each and every individual it denotes. Hence there has arisen the term *distributed*, a term of great convenience in logic. In particular propositions, on the contrary, the subject is not distributed.

§ 36. We have been classifying propositions thus far with reference to their form. We now pass to their consideration according to import or meaning. Proceeding in this manner we first divide propositions into *Propositions Verbal* and *Propositions Real*. A verbal proposition is one which conveys no information not contained in the meaning of its subject: a real proposition is one which affirms or denies something not contained in

the meaning of the subject. If I say—*A circle is a figure every point in whose circumference is equally distant from a point within called the centre,* I convey no information not embraced in the meaning of the word *circle.* In fact I give the definition of the word *circle*; I declare its meaning. A figure every point in whose circumference was *not* equally distant from a point within called the centre would not be a circle at all. The above is a fair sample of verbal propositions. They are also called definitions, analytical propositions, and essential propositions; in contradiction all others are called also synthetical, ampliative, and accidental propositions. The latter add to our stock of positive knowledge, while the former are considered only as unfolding what we already possess. Verbal propositions may be said to give information with respect to the name, it is true; but give none with reference to the thing. *Fire burns, A quadruped is an animal, Man is rational, Silence is absence of sound, Arithmetic is the science of numbers and the art of computing by them, Matter is impenetrable*—are further examples of verbal propositions. On the other hand, these following are real or synthetical:—*The fire kindles quickly, Quadrupeds have not means for as rapid locomotion as birds, Silence is oppressive, Arithmetic is an excellent disciplinary study, God visits the wicked with eternal punishment.*

The distinction between real and verbal propositions is not always clear nor always constant. It will be apparent that propositions which to some minds are real, to others are only verbal, according to the knowledge and experience of the persons concerned. *Oysters are bivalves* to a person who knew nothing about oysters would be a real proposition; the contrary, however, to people who daily open them or who regularly consume them, supposing, of course, that these people knew the meaning of the word *bivalves.* So to scientific men who are familiar with the larger connotations of many terms, propositions asserting characteristics or qualities would be verbal, whereas to the common apprehension they would be real. It is out of this variation that many difficulties and controversies have arisen to which I hope presently to make further allusion. It is worth recalling to mind that the question how synthetical judgments *à priori* are possible (that is to say, how synthetical propositions can be affirmed *à priori*) has formed a theme of discussion ever since the time of Plato and Aristotle, and is made the special subject of discourse in one of the most remarkable treatises the world has seen—Kant's

'Critique of Pure Reason.' Among the schoolmen controversies raged for a long period, and from their time even down to Locke, over the nature and meaning of essential propositions, which were supposed to reveal the inmost nature of things, and therefore to be of more consequence and importance than any other propositions or class of propositions whatever.

§ 37. Propositions are further divided into *Propositions of Quantity*, *Propositions of Existence*, *Propositions of Co-Existence*, and *Propositions of Succession*. This classification is according to things predicated, and is the most general and the most far-reaching of any of the classifications heretofore considered. Of course it will be in a degree a classification of nameable things, but our investigation here leads us only to consider the side which has its bearing upon propositions. Propositions of Quantity are those which predicate equality or inequality in all its variations. *Two and two are four*, is a proposition of quantity; as is also *Man is more noble than the brutes*. No reflection is needed to see the vast number and extent of the propositions included under this head. All the mathematical sciences and all the applications of quantity to science and art, theoretical and practical, are embraced; many measurements of mental characteristics are also made in propositions of quantity, as in the last example.

Propositions of Existence are those that affirm or deny existence of any subject, as *Man has existed many thousands of years*.

Propositions of Co-Existence are divided into two subdivisions —*Order in Place*, and *Co-Inherence of Attributes*. Propositions asserting Order in Place refer to the world of Extension. Everything expressing locality, inclusion in space, position, can be ranged under this head.

Geography is a body of propositions expressing order in place. But when we pass beyond the world of the Extended we come to a different kind of correspondence, to which the second of the two names we have just given applies. A stone has hardness, colour, weight, etc.; these attributes co-inhere in the object. So also there are various powers or faculties which co-inhere in mind; there is no separation of place, but a commingling or co-exercise in the same place. Propositions expressing this are propositions of co-existence as co-inherence of attributes.

Propositions of Succession have corresponding divisions into *Order in Time* and *Cause and Effect*. We recognise occurrences as sequences one after another as night after day, but do not

cognise any necessary dependence of the one before the other. On the other hand, when the lightning strikes a person and he falls dead there is also an order in time, but of a different character from the other. The idea of a power in the antecedent which produces or causes the consequent event is present and we term the relation one of cause and effect. Whence comes this idea of power and whether it springs from any other source than invariableness of sequence are questions we are not called upon now to consider. The fact is patent that we do make the distinction between simple sequence and causal sequence.

§ 38. Much might be said in greater detail of the scope and uses of these divisions of propositions according to their import. But to examine them fully and show how they include all propositions, would take us too far into the domain of logic. We are now engaged in noting concisely the structure, uses, and peculiarities of language; a simple observation of some prominent facts is all that is here demanded. Accordingly we will suffer this skeleton exposition of propositions according to their import to remain as it is, referring those who are desirous of prosecuting the subject further to the various treatises on Logic which illustrate the topic more fully.

§ 39. And here also we will close our enumeration of the various classes of propositions. We have marked the principal divisions and have derived, in the arrangement under classes, some information respecting the meaning and use of predications, which will be of value to us hereafter. Recapitulating, we find that Propositions are

According to their Form	Affirmative and Negative, Declarative, Interrogative, Imperative, and Exclamatory, Simple, Compound, and Complex, Categorical and Hypothetical, Universal and Particular.
According to their Import	Verbal and Real, Of Quantity, Existence, Co-existence, and Succession.

DISCOURSE.

§ 40. This subdivision is added to what has gone before for the sake of formal completeness, rather than with the expectation

of entering upon an exhaustive treatment of the subject. Were we to essay such an examination we should have to make an analysis of all literature, since the term *Discourse* here used signifies the entire address of one mind to others. But in looking at the constituents of language—words, names, and propositions, I conceive that for the purposes of this work we have done away with the occasion for studying the body of language as a whole. We could not pursue an investigation of language for our end without proceeding to analyse the elements of language, and having taken cognizance of these, an aggregate of these elements presents no new facilities for comprehending what language is, or for perceiving its imperfections. Discourse might be considered with reference to its form, leading us primarily to observe the different languages in which it is expressed, and secondarily different forms in the same language. In this connection we might take note also of metrical and non-metrical composition, leading us to separate prose from poetry. With regard to the purpose of Discourse, classification might be made, as into narrative, descriptive, argumentative, hortatory, etc. A classification might also be founded upon psychological analysis, for which, however, we are not here prepared. To treat this great topic adequately is the province of a philosophy of discourse or literature, which must take its place with other sciences, and with them rest upon the foundation of a general philosophy, the unity and unifier of all knowledge. In our classification of propositions according to their import, we have indicated divisions which include all discourse, and in such a manner as seems to be sufficiently serviceable for the objects of a system of psychology. We need not then concern ourselves further with the constitution and structure of language.

SOURCES OF ERROR IN LANGUAGE.

§ 41. Our exposition thus far has but made a proper preparation for a work still more important in view of our purposes in undertaking these remarks upon language. There remains the labour of exposing some of the necessary and accidental defects and confusions of language in recording and communicating thought. Many of these defects have already suggested themselves, but they have all been reserved for a general discussion in this place. When we have considered even those which will be presented here, our wonder will cease that misunderstandings and

controversies have been so common, both in the realm of thought and in the realm of things.

§ 42. A source of confusion in words and names is found in a pedantry which, looking too closely upon forms, fails to take proper notice of meaning and import. Many grammarians think that because a word is, for instance, ordinarily an adverb, it is inherently and peculiarly an adverb and never can be anything else. Thus when the proposition is before them, *The then ruler of England was a worthy man*, members of this class of reasoners are forced to tell us that *then* is an adverb used as an adjective. But when we consider again what adjectives are—words employed to mark cross divisions of namable things, and to limit or qualify substantive words, attributing something to the substantives; that all words having this office came to be called adjectives because there was need of a mark to designate this class, and that the name is subservient to the class, not the class to the name, we are able to see that in the proposition just quoted, *then* is not a word used as an adjective but *is* an adjective. The fact is not that the names of the different parts of speech were chosen arbitrarily, and every word assigned to a place under one of those divisions, with instructions not to trespass upon any other. If such were the case, the only way to answer the question, *What is an adverb?* would be to give a catalogue of adverbs. The names *verb, adjective, adverb*, were not originated to include droves of words as pens inclose droves of cattle, but to denote classes of words, each word in which is characterised by certain peculiarities which the class-name connotes; and any individual word manifesting those peculiarities belongs properly to the class which is distinguished by the same peculiarities. I would not here be understood as maintaining that the phrase we are considering is the best for expressing the idea; all I wish to note is that words which usually belong to one division, sometimes in being employed in the use of another division, belong to that other class as appropriately and completely as if they were always associated with it. *Then* is sometimes an adverb and sometimes an adjective —not an adverb used as an adjective. Such a use of words is not very common in English, but is frequent in the Greek, as with *νῦν* and *πάλαι* (*οἱ νῦν ἄνθρωποι*, the *now* men, that is, men of the present time; *οἱ πάλαι ἄνθρωποι*, the men of former times).

In similar fashion words ordinarily substantive are sometimes adjective, as *A man child is born:—man* here is an adjective.

Often two words thus related are connected by a hyphen, as *bull-dog*; and in some cases they finally become united in one, as *godfather*. This same peculiarity is observable with reference to other parts of speech, as where the same word is sometimes conjunctive and sometimes adverbial or prepositional; or sometimes adverbial and sometimes prepositional; as ὡς in the Greek, *contra* in the Latin, and *without* in English. Grammarians ordinarily agree with reference to the minor parts of speech that the same word may belong to more than one division according to its use: ὡς is called a preposition, an adverb, and a conjunction in good Greek grammars. Hadley ranks it as a comparative conjunction and defines comparative conjunctions as 'properly adverbs of manner.'[1] And it may be conjectured that no intelligent scholar would fail to parse *without* in the phrases *without him* and *the people without*, as in the one case a preposition and in the other an adverb. But when the higher parts of speech are considered, it seems to some like taking too great a liberty to say that a word which is an adverb or a noun can so change its character as to be also an adjective. This reluctance may come from an unwillingness to break long-continued associations or from the hazy notion already alluded to of some inherent properties in words by virtue of which they are nouns or adverbs and cannot be anything else. In any case the notion is a delusion and an error. The importance of noticing these facts here lies not in establishing whether a word is an adjective or an adverb, for that would be a matter of more importance to a student of grammar; but in securing a prophylactic against the habit into which all are inclined to fall, of regarding forms of words and classifications according to forms as giving the truest knowledge of words and as marking unchangeable boundaries and limits in language. The natural outcome of such a habit is to make thought subsidiary to language and cause an ignoring of the truth that language is a growth perpetually modified by changing needs to promote the great ends of thought-communication. The value of names for classes or groups of words is found in their aptitude for expressing common properties, but when the classification becomes a mere enumeration of particular words, it ceases to have any significance or to be of practical importance. But besides such negative results there are positive ones still more harmful. Minds are actually misled and a hindrance is interposed to a true apprehension of the essential nature and functions of language. The flexibility

[1] Hadley's *Gr.* Sec. 873.

of language is impaired and its use is made more formal and pedantic. Such injurious effects upon freedom in the employment of language will inevitably be extended to thought and damage both science and art by circumscribing and cramping their development. Language should have definiteness of meaning to be sure: but this does not require that distinctions shall be drawn where there are no distinctions.

§ 43. A moment ago it was said that grammarians usually allow with respect to the minor parts of speech that the same word may belong to more than one division, that is to say the same word may have more than one application in marking and hence more than one meaning. As we proceed into the higher divisions of language we discover that the same word in form may have totally different significations. Now where these significations are clearly distinguished there seems to be little advantage in calling the words that express them the same, because their forms happen to correspond. Considered with reference to their meaning they are in reality different words. I am not now speaking of the metaphorical use of words, though perhaps the same line of remark might be extended in that direction: but of the radical and original differences of meanings between words of the same form. If we could follow up the history of words, very probably we should find that many words of the same form but of meaning apparently not allied in any way have been at some time connected in meaning and the one to have sprung from the other; as *porter*, a malt liquor, is supposed to have been so called from the fact of its having been characteristically the drink of porters or carriers: but in many cases we are not able to trace any connection at all. *Scale*, a thin shell or layer (Ang.-Sax. *scealu*, a shell), and *scale*, a ladder (Lat. *scala*), seem to have no community of meaning; so also *saw* (A.-S. *sagu*), a saying or proverb, and *saw* (A.-S. *saga*), an instrument for cutting; *port* (Lat. *portus*), a harbour, and *port* (Oporto, a town in Portugal), a wine; *card* (Lat. *carduus*, thistle), an instrument for combing, and *card* (Lat. *charta*), a piece of pasteboard. Sometimes while the sounds of the words are the same they are distinguished by differences in spelling; at other times there is nothing at all to distinguish them. It is seldom the case, however, that any ambiguity arises from this peculiarity of a language to a native speaker of the same, for usually the connection will disclose the meaning, but to a student of a foreign language this absence of discrimination in the form is often very troublesome, while in the monosyllabic

languages (like the Chinese) it is a very great evil and must be a constant hindrance even to native users. It need scarcely be said that the difficulty lies not in too great an economy of words (for a wise economy in that direction is a blessing), but in the total absence of any distinctive mark to indicate a difference. If the word *red* were at the same time the mark of red and blue, the inconvenience would be quite annoying; and it may sometimes be found a source of inconvenience and error that *chase* is at once the mark for a pursuit, a frame used by printers, and a rude groove. There might have been occasions when the Latin hearer would have been perplexed and perhaps mistaken from the use by a speaker of *deligo*, which means both *I bind* and *I select*; as also the Greek from the use of πλῆμι, which may signify *I fill* and *I bring near*. Many such examples occur in all languages.

Ambiguities and confusions arising from the forms of words need not engross our attention further than to enable us to note them. These defects of language are practical inconveniences, which do not ordinarily tend to occasion or perpetuate errors in philosophy. But all defects in language are not equally harmless in that regard; and if the structure of language has itself sometimes been the cause of false philosophies, an ignorant and careless use of it has been the cause of many more. To some of these grave defects let us now address ourselves.

§ 44. Only a small portion of namable things have distinctive names. As analysis progresses objects are decomposed and we see that what we before supposed to be simple is in reality complex and compound. But the use of names to designate complex wholes has become established, and the associations connected with them are so strong that people can scarcely fail of receiving from the names more or less confused impressions. So long as words which have been conveying errors remain in use, they will continue to occasion error. Often it is not possible, frequently it is not desirable to eradicate the words from language. The only way then in which these false or confused ideas can be corrected is by a frequent and thorough exposure of the confusion lurking in the word or name, to the end that its use may at least be an intelligent one. Confusion from the paucity of names arises in connection with the simplest sensations. Smell, hearing, touch, taste, and sight, all furnish illustrations. If I say *The rose has an agreeable smell*, the hearer does not know whether I mean to convey the idea that my sensation is of an agreeable smell or that an

agreeable smell as a quality resides in the object *rose*. The word *smell* may be the name of a sensation or of a quality of the object. The word *sound* may mean either what I hear, that is the sensation of hearing, or that which produces the hearing—its antecedent or cause residing in the object. In the proposition, *I hear a sound*, it is indefinite whether in using the word *sound* I am speaking of what is emitted by the object as belonging to the object, or as referring to the sensation in my ear. In the case of sight, the same ambiguity exists. *I see a beautiful sight*—here the term *sight* refers to what is seen. *The sight of it affects me*—here reference is had to my experience of sight, my sensation of it; while in *My sight is dim*, the meaning is that my capacity for seeing is impaired. In all these examples there is an ambiguity in the words of which we have been speaking. *Smell*, *sound*, and *sight*, are equally names for qualities of the object or of the object itself, and our sensations. It may be said that all we know is the sensation, and that hence all we name is the sensation. But this is not strictly correct. We distinguish between the affection of our sensibility and something which we believe has objective reality and to which we ascribe our sensations as effects to a cause. This objective reality thus believed in together with its attributes is marked by a name, and from this we distinguish the sensations received by us and name them: but, as we have seen, very often the names for the sensations and the objects are the same, and this works confusion of thought. For, in using a word we do not sufficiently consider whether we mean the object or the sensation, and we reason upon either or both with freedom, although our reasoning legitimately has reference only to one. We cheat ourselves with the belief that our logic is trustworthy when we are in reality permitting a non distribution of the word which is a chief term in our syllogisms.

It is also worthy of notice that not only does the same word stand as a mark for both the object and the sensation, but also for the idea which can be reproduced when the object and sensation are absent. Thus *house* is the name of an object, a cluster of sensations and an idea or mental reproduction of the external. John Stuart Mill seems to think that when we mean to designate an idea of a house, we *say*, 'idea of a house,' which latter is properly the name of the idea, while *house* is left as the name of the object and sensations. And yet we do, I think, actually make use of the word *house* as a name of our idea of a house. Suppose

we wish to reproduce our idea of a house in discourse when there is occasion for the name without necessity of nice discrimination; I conceive we use the word alone as a name for the idea. In the proposition, *A building which is inhabited by men as a dwelling-place is a house*, *house* is obviously the name of an idea and an idea of a house. We should hardly say, *A building which is inhabited by men as a dwelling-place is my idea of a house.* A person studious of accuracy would probably discriminate by some circumlocution between the name of an object and the name of an idea, but it seems to be indisputably the fact that a large majority of people do not distinguish. Hence arises a real ambiguity of language.

§ 45. Perhaps the grandest source of confusion of thought is the variation of connotation in words. It will be recollected that the great body of connotative names is made up of general concrete names. Thus the word *house*, of which we have just been speaking, denotes a given object or class of objects and connotes all the attributes of the class. It may imply to different persons some or all of the attributes of form, material of composition, manner of structure, size, doors and windows, floors, chimneys, blinds, furnishing shelter, put to use for storage or habitation—in fine everything or anything that goes to make up the idea of a house, all these implications being grouped around and associated with the word which denotes the class of objects. It is evident that these implications or associated ideas will vary according to the experience of the person entertaining the idea. If a man has lived in a New England village, perhaps with the name *house* will be associated inevitably the idea of green blinds; if he be an inhabitant of Philadelphia, possibly the idea of white shutters. Thus in the one case, the use of the word *house* will raise the idea of a building with green blinds, while the speaker may have the idea of a building with white shutters. Now, when we speak of a word's connotation we mean its proper connotation, that is the connotation which it ought to have, not all the connotations it does have among men of different degrees of information and education. No one's personal implications or associations determine the meaning of a word or name, but the connotations which the highest general knowledge and the best general usage have attached to it. Though to a particular person *house* may connote *green blinds*, this is no part of the proper connotation of house, nor, indeed, is *blinds* at all, for many houses have no blinds and

a house is a house still whether it have blinds or not. Since, however, incomplete, unnecessary, and even erroneous connotations are all the time attaching themselves to words, the true connotation being undefined and indeterminate, all sorts of errors are constantly creeping into discourse. In consequence of this fact to declare and fix the proper connotation of words becomes a matter of no inconsiderable importance to philosophy and through philosophy to practical affairs. Where then, it will be asked, is the true connotation of a word?

§ 46. The schoolmen of the middle ages made use of a term which was supposed to be of assistance in determining the nature of things. This word was *essence*. That was said to be of the *essence* of a thing without which a thing could not be or be conceived to exist. Three straight lines joining each other at both extremities of each are the *essence* of a triangle. If one be removed what remains is no longer a triangle. Though the schoolmen waged controversies innumerable over this word and did not apprehend its true significance, a consideration of that significance here will supply us with a very desirable word to express completeness and propriety of connotation. The true connotation of a name is all that without which the name would not be appropriate as a mark of the thing named. The word *animal*, for example, connotes self-activity. When we say that we could not conceive of an animal without self-activity, all we mean is that our idea of animal involves self-activity, and if we found something without self-activity we should not term it *animal*. Thus we say *self-activity* is *essential* to an animal. Understanding thus the meaning of *essence* and *essential*, we may appropriately and usefully regard the true connotation of a name as the sum of the essential attributes of the thing named. The process of declaring this connotation is definition, a complete definition being a declaration of the entire essential connotation of a word or name.

§ 47. It will at once be conceded that, take what care we may to define words and determine what connotations are essential, there will nevertheless always exist difficulties of the same, or similar character to those already noticed. It is not practicable to determine accurately and completely what attributes are essential to a namable thing and what are not. Essential attributes themselves are all the time varying as circumstances change and knowledge progresses: differences of opinion, differences of

statement, and differences of fact which cannot be harmonised are thus constantly arising. I say cannot be harmonised because circumstances cannot be made the same. One mind declares something as essential, while another regards the same thing as non-essential. The truth is that it is both: essential, according to the knowledge and circumstances of the one; non-essential as regards the experience of the other. To the untutored mind the name *wolf* connotes merely certain attributes of external appearance which to him are essential; while to the educated naturalist these attributes may not be at all essential. The latter has for his connotations peculiarities of structure or habits, and these are to him the essential connotations. Ordinarily the name *crow* connotes blackness, but the moment a person saw a white crow, the attribute of blackness would cease to be regarded an essential connotation. The clown connotes hardness as an essential attribute of matter and never thinks of the air about him as matter. The famous king of Bantam who had never seen ice connoted fluidity as an essential attribute of that combination of elements which we call water. A person who had never seen a gun discharged or heard of its use would not connote with that name the attribute of shooting power. To a person who knows nothing about oxygen the name does not connote magnetism; to the scientific mind it does. To an unburned child fire may not connote burning. From this line of observation it will be noted how the essential connotation of names varies according to the degree of intelligence and the circumstances of the user; furthermore it may be seen how the essential connotation of words is all the time changing, even with the learned, keeping pace with the progress of discovery. Before scientific investigation had revealed the fact of its composition *blood* did not connote white corpuscles and red corpuscles as essential. Until Newton, *matter* did not essentially connote attraction directly as the mass and inversely as the square of the distance. So with words of higher generality. There are so many meanings and uses of the word *law* that it is extremely difficult to determine what is its essential connotation: probably the connotation cannot be determined accurately. The word is used to designate an immense variety of commands, statutes, injunctions, and rules laid down by some recognised authority; very frequently it is applied to various statements of general facts, as *a law of the mind*. The word *reason* is another illustration.

Reason connotes the power of speech; but the man who claims that brutes have reason does not reckon the power of speech as an essential connotation of the word. *God* connotes essentially omnipotence, but not to the people who believe in a pantheon of limited deities. *Consciousness*—who in view of the long series of metaphysical disputes over that word will venture, without preparing himself for a full discussion of the subject, to affirm what are its essential connotations? These illustrations show clearly enough how from this circumstance of variation in connotation, there must be a perpetual failure of language to effect the end of perfect communication, and how there must arise in the use of language frequent misunderstandings leading to many logomachies.

§ 48. Definition has been always considered a process for explaining and determining the meaning of words, but men have been ever prone to content themselves with a superficial definition; flattering themselves that they have gotten all the meanings of a word when in truth they have only a part of the meaning: and adhering obstinately to their own chosen definitions they often blind themselves to greater truths lying beyond the scope of their narrowed vision. As has been observed, a complete definition is the sum of the essential connotations of a word. A partial or incomplete definition may be a statement of one or more (but not all) of the essential connotations of a word; or a statement of accidental properties, that is a description. Sometimes, definition is attempted by predicating another connotative word, which is similar in its connotations, thus as it were finding the value of x in terms of y. Of the first class of incomplete definitions which so far as they go are real definitions, we may instance: *A horse is a quadruped; Man is a rational animal; God is a being who is omnipotent.* Of the second class, properly not definitions at all but only descriptions, we may notice: *Man is a creature which wears clothes, Homo est bipes implumis; Wisdom is a precious possession.* Of the last class the following are examples: *Virtue is complete manhood; Freedom is liberty; Prudence is foresight.* This class is not distinct from the other two, but may include propositions which can be ranked under either one or the other of the two preceding. Many of these pseudo-definitions are mere identical propositions.

§ 49. The desire to make definitions complete is by no means a general one on the part of the users of language. As language is only a method of marking things, any word which for the moment

will serve to designate the thing under consideration, so as to separate it with a greater or less degree of distinctness from other objects, will be readily adopted in very many cases. Hence the definitions most generally received are those which indicate some one prominent quality of the object. Names themselves suggest the definition most generally thought of. Thus he who gave the name *oxygen* had prominently in mind as its definition '*sour stuff*.' Webster gives as the first definition of a hieroglyph, 'a sacred character' (i.e. *littera*). The spelling-books in use in schools are full of such definitions:—'*Wheel*, a circular body;' '*Wart*, a hard excrescence;' '*tail*, the last end;' '*tents*, movable lodgings;' '*viol*, a musical instrument;' '*mines*, subterraneous works;' '*oar*, a pole with a broad blade;' '*pail*, a wooden vessel;' 'lynx, an animal remarkable for sharp sight;' '*maid*, an unmarried woman;' '*guano*, an excellent manure.'[1] Definitions like these will pass current in ordinary usage, but the effect is to impress people with partial and incomplete ideas of the things which the definitions seek to explain. There are a great many circular bodies that are not wheels; a great many hard excrescences that are not warts; many subterraneous works that are not mines; many last ends that are not tails. It is true that a lynx is remarkable for sharp sight, but such a definition as the above tells us nothing else about the animal, and so far as the definition indicates a lynx might be a bird or an insect. A viol is a musical instrument, but to define it as such in no wise distinguishes the instrument from a church organ or a Jew's-harp. Maid is synonymous with virgin, and the state of virginity has no necessary connection with or opposition to a state of marriage. So with all definitions of this character. Unless pains be taken to look carefully and comprehensively at the terms used a narrowness will be fostered inevitably working mischief.

§ 50. Probably enough has been said to illustrate the ambiguities and perplexities arising from the connotations of names and words. It is not possible to avoid these difficulties. If we could determine accurately what things are absolutely distinct and separate and should give a separate name to every namable thing and dispense altogether with class names, we might of course escape the ambiguities that arise from the connotations of general names; but if this result were possible, the disadvantages of a language thus made up would more than outweigh the disadvantages arising

[1] These definitions are taken from Smith's *Etymology of the English Language*, N. Y., 1869.

from connotation. What we can do to obviate the latter is simply to make ourselves acquainted as far as possible with the true and complete connotation of a word, as determined by the highest knowledge and the best usage we can find. Then we can employ language for simple statement or complex reasoning with less fear of deceptions and entanglements. But considering the fact that with the most scrupulous care and the most unwearied patience we can hope only to obtain a relative accuracy, it becomes us to be quite modest in our assumptions of correctness and certainty for the results we reach.[1]

§ 51. We now come to an ambiguity which has been the source of much confusion of thought, and which deserves to be always noticed in any treatise on the defects of language. We have seen that in many cases predication is affected by means of an attributive word and a copula. This copula in English and in most other languages with which we have anything to do is, in its various forms, the substantive verb *to be: John is good; The spring will come; He was an old man*, etc. From the fact that the use of this and the kindred verbs as a copula has been so extensive, many have come to suppose that predication in itself is inseparable from an assertion of existence, and thus that the idea of existence or objective reality is interwoven with language, and bound in with it indissolubly, the supposition leading to an assumed argument for the existence of innate and necessary ideas. *John is good*; that is, reason these philosophers, *John exists* and *John as existing is good*; so *matter is extended, impenetrable*, etc., that is, *matter exists and as existing is impenetrable, extended*, etc. In like manner from expressions like *God is good*, theologians have reasoned that we have an argument for the existence of God, since in attributing anything to Him we invariably predicate His existence, language bearing witness to His being. The error is simply that confusion is made of the two offices of the substantive verb and account is not taken of the fact that when used as a copula it is solely a copula and nothing more. If some other verb or word had been taken as the copula, no such confusion would have arisen. In considering the verb when used as a copula, we must eliminate from our attention any proper signification which it may itself have independently of its copulative usage. To the exposure of this ambiguity in the

[1] Cf. Mill's *Analysis of the Human Mind*, Chaps. IV, XIV; Mill's *Logic*, Bk. I. Chap. II. Sec. 5; Bain's *Logic*, Deduction, Bk. I. Chap. I.

copula we are largely indebted to the two Mills, James Mill having quite minutely illustrated it. Dr. Andrew Findlater has ably reinforced the argument by showing that there is no necessary connection between predication and the substantive verb, from the fact that in the Philippine dialects there is absolutely no substantive verb at all, predication being effected chiefly by pronominal affixes, and the indications are that all languages began without the substantive verb. Professor Whitney illustrates the same fact, making the assertion that in the Semitic languages the equivalent of the verb *to be* is generally wanting, the uses indicating predication by the form or position of words. Where in English we say *The man is good*, they say *The man good* or *The man he good.*

There is no one system of philosophy, so far as I know, which can be selected as affording the most prominent examples of fundamental corruption wrought by a failure to take note of the ambiguity of the copula. But the ancient methods and some of the modern have suffered more or less extensively from this cause, speculations being often confused where a resolution of the ambiguity in the copula would have cleared them up. In some cases positive errors have been made upon this very subject. It may well be suspected that Plato and the Sophists would never have found occasion to dispute so much over problems concerning the existence of entities corresponding to class names, had they understood the meaning of the copula. The logomachies of the schoolmen were fostered and perpetuated oftentimes by the same ignorance. In all periods it may be presumed that even when by able or mature thinkers a discernment is made between the two offices of the verb *to be*, the little prominence given to the distinction in philosophical treatises has had the effect to mislead many younger or less practised. Men get into their heads an indistinct notion that as when predication is made existence is asserted, existence is necessarily to be attributed to and always belongs to the subject. For those who are in this predicament, no better prescription can be given than to consider attentively the proposition so many times cited for this very purpose—*A centaur is a fiction of the poets*: the prime object of the proposition being to declare that no such being as a centaur has existence.[1]

[1] Jas. Mill's exposition of the ambiguity of the copula is most admirable. Cf. *Analysis*, &c., Chap. IV. Sec. 4.

§ 52. Closely associated with this source of error is another, to which a slight allusion has just been made, and which deserves to be noticed in the same connection. Some of the ancient philosophers maintained very strenuously the existence of entities of which class names are the marks. The name *dog*, for example, is a general name; *Carlo*, *Fido*, *Tray*, are individual names. These philosophers would say that there exists objectively a class or genus *dog*, of which *Carlo*, etc. are individuals, and that Carlo is a dog by reason of his partaking of the *essence* of a dog. So, passing from concrete to abstract names, they maintained that *prudence*, *wisdom*, *goodness*, are entities, and that a man is prudent, wise, good, so far as he partakes of the essence of prudence, wisdom, goodness. In fine they ascribed objective reality and a separate objective existence to these ideas. So far indeed did Plato go, as to characterise such ideas as alone having true existence, and to regard things as being copies of them—a very curious inversion of truth. Plato's doctrine of ideas involved much more than the ascribing objective reality to class names. He also constructed a philosophy of the mind, a theology and a system of ethics with the same doctrine as a basis; not taking pains to distinguish between his innate ideas used as subjective regulative principles, and the same used as objective existences; he called both by the same name. Hence to the error of failing to perceive that his objective existences corresponding to class names were figments, he added the further blunder of mixing them up with the powers of the mind itself. The first of these mistakes is all we need to notice here. To the fact that he made it we can ascribe a large portion of the haziness of Plato's speculations. He seems to have been engaged in a perpetual struggle to find a habitat for his universal ideal entities, and to connect them with real things. Naturally enough he could not find one. Where does prudence in itself dwell, and how is it possible to conceive of it as having separate existence apart from somebody who is prudent?

Plato's idea of the Good well illustrates the extremes to which he proceeds. In the 'Republic' he says (VI. 506 [1]): 'In the same manner as the sun is the cause of sight and the cause not merely that objects are visible but also that they grow and are produced, so the good is of such power and beauty that it is not merely the

[1] Jowett's Translation. This is only a sample. Many passages from Plato could be cited of equal value for present purposes.

cause of science to the soul, but is also the cause of being and reality to whatever is the object of science; and as the sun is not itself sight or the object of sight, but presides over both, so the good is not science and truth, but is superior to both, they not being Good itself, but of a goodly nature.' Now were we to interrogate the sage of the Academy as to whether he means it is a good man that is 'of such power and beauty,' or the sum of all good things wheresoever they may be, or even a good God; we should get only the answer, 'Not a good thing nor all good things, a good being nor all good beings, but *The Good!*' No wonder men have puzzled their brains for so many centuries to find out what Plato meant. He never knew himself, but groped about ineffectually seeking to bind his doctrines together into a philosophy, but lamentably failing; expressing opposite views; now catching a glimpse of the exact truth and now losing himself in a cloud of poetic exhalations. He saw clearly the intellectual antinomies but knew not what to make of them nor how to reconcile them. The cause lay in the state of then existing knowledge, and with his mental constitution he could not help placing himself awry on such points as the one before us. And no infinitesimal portion of the difficulty occurred at this very point. He was not able to see that his objective essences were mere wills-o'-the-wisp and that the only reality to be considered in connection with them is the reality that they are but names and ideas existing in the mind. In the first instance probably for the purpose of economising language and then for the purposes of predication and of classifying objects, men have invented certain general concrete names which are merely marks to denote a group of objects; they have also invented for similar purposes abstract names which are names of attributes. And the general cognitions represented by them exist when the objects which gave rise to them are not present, but they have no possible significance except in relation to those objects.

This difficulty has more or less pervaded all the philosophy which has emanated from Plato, down to the present day. It is very largely exemplified in German philosophy. The terms 'Absolute,' 'Unconditioned,' and the like bear witness. Thinkers seek to demonstrate the valid being of the absolute, forgetting that 'the absolute' is only a name of something which is *absolved* (that is from dependence or relation—independent). While it would be entirely legitimate to inquire whether there is anything

or any being 'unconditioned,' or whether we can conceive of such, a search for *the* absolute or *the* unconditioned only fills our mind with a vapour which befogs and blinds us. The term, 'The absolute,' may be serviceable as a description sometimes, but the meaning of the term should be clearly understood before its use is attempted. Class names are not the names of objects or things having objective reality outside of the mind; but they are names derived from things and have relevancy only to the objects from which they are derived.

§ 53. The fact that both individual and class names have to do duty for a great number of things in denotation as well as connotation, increases greatly the dangers and complications arising from language. In many cases of the use of a word having two or more distinct denotations or sets of connotations, the context or the accent and gesture of the speaker removes all ambiguity: but very frequently no help can be obtained from these sources, even when the idea of the uses of the word is clear. But men universally employ words when they *have* no clear idea. They have an indistinct notion which they desire to express and catch at a word which they fancy will answer their purpose. The word employed may in its denotation even convey a different idea from the one the speaker has been endeavouring to find expression for. This is a fruitful source of misunderstanding. Prof. Whitney says of our own language: 'The English of no two individuals among us is precisely the same; it is not the same in form; it is not the same in extent; it is not the same in meaning.' In common conversation difficulties of the kind we are considering are made of less account by the fact that opportunity exists for asking questions and drawing out explanations and qualifications. In literature, however, readers are put upon their own resources, and errors are frequently made which are fruitful of injurious results. Before passing to an entirely different subject, I will cite a few more words illustrative of this whole matter of ambiguity in denotation and connotation, with which we may conclude our present consideration of the topic. *Origin*, for example, may mean either the cause of anything being produced or the occasion of its production; the word *same* may denote identity or a high degree of similarity; *sincerity* may denote reality of conviction, that a man actually believes what he professes to believe, or it may be employed to express unbiassed conviction; *spiritualism* may denote a system of philosophy, as opposed to materialism, or it may indicate a system

of belief in the visitations of disembodied spirits—in the former sense being often a term of respect and in the latter of reproach and contumely; a *theory* may be to one man an exposition of things observed, while to another it is an assumption or hypothesis by which to explain things observed. These are common instances, where a misleading effect is very frequent. More than one system of 'spiritual' philosophy has suffered among the vulgar by being associated with table-tipping and communications from so-called spirits. The word *theory* has been so perverted that in general use it is a synonym for hypothesis. The inaccuracy in the use of the word *same* is very frequently observable. Evils of this description, unfortunately, cannot be wholly eradicated. High education and a careful training in the precise and exact use of words, together with a critical habit of studying the words of others, will do all that can be done to remedy the difficulties.

§ 54. In discussing the subject of relative and non-relative names (§ 24 ff), it appeared that a relative name has no meaning except with reference to its correlative. Inattention to this fact has been the source of much trouble in science and philosophy. The bad consequences flowing therefrom have been mainly resultant from the attempts of men to build philosophies upon some supposed fact or facts expressed by one of two relative names, ignoring the equal importance of the other and the necessary connection of the two. Such philosophers have failed to apprehend that in a pair of relative names each connotes the same state of facts as the other. While this has been the chief difficulty, it has sometimes been the case also that where the relation of a pair of names has been recognised, people have sought to find some mystic relationship between the things which the words mark. Some words are so obviously relative that we can scarcely avoid referring from one to the other. *Brother and sister*, *father and child*, *husband and wife*, are pairs of words which are so indissolubly related that the idea of the one consciously raises the idea of the other. But not in all cases do we find a readiness to allow the close dependence of one relative word upon another, and in many instances it is not appreciated that words *are* relative words. The terms *finite* and *infinite* furnish a ready example, as do also the pair *conditioned* and *unconditioned*. Speculation in regard to the infinite would have been much less reckless if men had taken cognizance of the fact that *infinite* has no meaning except with reference to *finite*. If there were no finite there would be to us no

infinite; if there were no infinite there would be no finite. The word *finite* means limited, and placing a limit implies an unlimited from which the limited is cut off. The word *infinite* means that which is not limited, the greater circumscribing the less, but being greater only as compared with the less. Perhaps the terms *Ego* and *Non-Ego* furnish as remarkable an illustration of non-observance of the correlation of words as any that can be produced readily. *Ego* means the conscious self as distinguished from all that is not self. *Non-Ego* means that which is not self as distinguished from the conscious self. Philosophers on the one hand have sought to assign an independent being to the Non-Ego on grounds which they supposed were sufficient to exclude an Ego, but which in fact have no meaning or substantiality whatever except as allowing equally an Ego. Such reasons have always failed. In like manner others of quite opposite tendencies have failed who denied reality to the Non-Ego, not understanding that there is as much reason for conceding reality to the Non-Ego as to the Ego. In the whole history of philosophy it appears that scholars, with a one-sidedness which would be astonishing were it not exhibited in all human affairs, have built systems now upon the Ego, now upon the Non-Ego; each taking little account of the other as throwing any light upon the problems sought to be elucidated. We should not understand, however, that the opposition which has arisen between subjective and objective philosophy has grown wholly out of failure to understand the true meaning of words. Thinkers have considered only one side of indissolubly related *things* while those of another party have considered only the other side; out of this has arisen for the most part the oppositions of philosophy; but, had the philosophers investigated more thoroughly the history, use, meaning and relations of words, undoubtedly the scope of their vision would have been broadened, their insight into things would have been deepened, and many of their errors would have been avoided. While, therefore, it would not be true to assert that the irreconcilable controversies of subjective and objective philosophies have arisen and been maintained wholly because of incomplete or erroneous understandings of words, yet errors arising from and defects in language have had a great deal to do both with originating and perpetuating those controversies; for they must needs have taken place through the medium of language.

§ 55. In the use of propositions there have always been encountered certain stumbling-blocks which only a thorough analysis

of language has succeeded in removing. We will notice those which exemplify some common blunders and confusions. The first is an attempt to remove the distinction between affirmative and negative propositions by attaching the negative word to the attribute of the predicate, and considering every denial as the affirmation of a negative name: for example *the house is large. The house is not-large.* The vice of this method of looking at negative propositions by which they are made affirmative of a negative name is that it tends to confuse two things essentially different while no real identification of affirmative and negative propositions is effected. Those who make the attempt in this way gain nothing whatever for their point. The presence and the absence of an object are two radically distinct things. Therefore by saying that negation is only affirmation of a negative name we really establish nothing, for a negative name is only a name expressive of absence or privation, while a negative proposition expresses nothing more nor less. *The house is large* and *The house is not-large* express two opposite facts; the facts are not altered at all by putting a hyphen between *not* and *large*. But when that mark is inserted, in reality or in effect, the impression made upon a careless student is that somehow affirmation and negation are the same thing. The opposition between affirmative and negative predication is indicated naturally and properly by a division of propositions conforming to it. There is no scientific or practical advantage in seeking to obliterate the distinction between these propositions, but all the disadvantage of confusion from the employment of a verbal subtlety. The negation can be considered better as attached to the copula than to the attributive part of the predicate.

§ 56. We have already met with an ambiguity in propositions by which it is not made clearly apparent whether the subject is taken distributively, or not. If I say, *Men are wise*, there is nothing in the form of the proposition or the words used to complete it to indicate whether I mean *all men* are wise or only *some* men are wise. We can infer from our general knowledge of human nature that it is meant *some* men are wise. If I say, *Men are mortal*, the same difficulty presents itself and our general knowledge called in aids us in concluding that *men* is here used distributively. If now I say, *Men are selfish*, our general knowledge is not of a sufficiently absolute nature to enable us to interpret the meaning. A child who has had only experience of the generosity and kindness of parents and friends and is himself

unselfish and kind would not naturally suppose that a speaker using the above proposition intended to affirm that *all* men are selfish but only *some* men. A person who has spent his life among thieves and who is himself thoroughly selfish would infer perhaps that the speaker meant *all* men. The ordinary man of the world who is brought into contact with a variety of people of different grades probably would say, *most* men are selfish, was the meaning. Expressions of just this character are employed very frequently; and there are many where the ambiguity is less easily resolved. Often statements are made where the subject is ambiguous, which are accepted, reasoned upon, and the conclusions believed as universal. Proverbs and old sayings furnish abundant examples. But even apart from these, assertions of facts are often taken universally when at best they are true only of some, and men regulate public policy or essay to control public morality upon them as if they were true universally. This however is oftener the result of interest or prejudice than of erroneous apprehension of truth; but people who are influenced by such motives are very willing to avail themselves of mistakes of fact or untrue dicta in order to persuade or blind those who otherwise would oppose and thwart their designs. These latter consequences however, as flowing from or as affected in any degree by ambiguity of language, do not concern us here. Our present purpose is only to exhibit this as a hindrance in the way of obtaining philosophical truth from language. And in this respect ambiguity has given rise to a juggle in reasoning of a very serious character; by which, through taking a term as undistributed in the premisses and distributively in the conclusion, a false result is obtained. Treatises on logic exhibit very fully this error of 'undistributed middle,' and the common reasoning of life shows abundant examples of its perpetration. *Labour is honourable; the operations of burglars are labour; therefore the operations of burglars are honourable: Gifts occasion pleasure; this white elephant is a gift; therefore this white elephant occasions pleasure.* In a somewhat similar manner the word *all*, generally employed to indicate universal propositions, in a collective use sometimes misleads: *All the angles of a triangle are equal to two right angles*, meaning not *every* angle or *each* angle, but all of them taken together; yet it is possible to infer from this statement that A, one of the particular angles of the triangle, is itself equal to two right angles.

§ 57. A misunderstanding of the nature of propositions merely verbal has wrought disastrous consequences in the history of philosophy. As has been already stated, essential or verbal propositions have at some times even been regarded as furnishing the main if not the only subjects worthy of philosophical consideration. It was supposed that real additions could be made to our stock of positive knowledge by reasoning upon these propositions. The habit resulting from this contributed largely to induce a neglect of all experiments and indeed of all observation of things. The error is allied to that of the Platonists who believed in the existence of real entities corresponding to general names. Both are part and parcel of a method of thought which despises analysis of language and rests content with a superficial observation of things. By philosophers of such a character as is here implied it is supposed thoughts expressed in words correspond infallibly to things, and that by logical deductions from propositions to which the mind gives assent, the whole explanation of material and mental phenomena can be completed. This error has largely characterised what has been termed the 'subjective' method in philosophy. The Eleatics, Plato, to some extent even Aristotle, and notably the schoolmen give evidence of the corruption wrought by an inability to understand the true relation of words to things. The most daring and imposing attempt to build upon words and verbal propositions is found in the philosophy of Hegel, whose system is comparatively valueless from that very cause. Locke in a measure cleared up the confusion which had filled speculation growing out of errors and misunderstandings like those we are discussing, and the work has been very thoroughly completed by some of his successors. An essential proposition merely unfolds the meaning already contained in the name which constitutes its subject. It gives no proof of the objective existence of that subject and when reasoned from adds no new fact to our knowledge.

§ 58. In completing our task of calling attention to some sources of delusion and error lying in and more or less inseparable from language, we must advert generally to the harm resulting from a proneness on the part of mankind to accept figurative language as conveying exact truth. Men are eager for illustration and do not as a rule love the bald terminology in which alone scientific statements can sometimes be made. This is a fault of education which vitiates very generally the philosophising of the vulgar and often manifests itself in high places as well. In

religious matters more than anywhere else this is conspicuous. People can readily be found, even among those claiming to be theologians, who seek to direct their own and the lives of other people upon interpretations of figurative expressions which, if closely analysed, would be found to have no meaning at all; or if any meaning one which if applied as a rule of conduct to actual life would be adverse to the best interests of the one following it. How many are the absurd practices which have arisen in all ages from a literal interpretation of figurative biblical language. It is not long since that a band of college students in a central interior state of America ceased to make provision for their daily wants, relying upon the Scripture injunctions to take no thought for the morrow and the promise that every one that asketh shall receive. Monks and ascetics of all periods have found justification for starving, mortifying and maiming the flesh from precepts like these:—'And if thy hand offend thee, cut it off: it is better for thee to enter into life maimed than having two hands to go into hell, into the fire that never shall be quenched.' Perhaps the most curious of all the delusions of this sort are those beliefs in regard to heaven and hell which have sprung from bible expressions of a similar character to the one last quoted. For a long while the church insisted on a literal material hell of fire and brimstone; and to-day among the uneducated the same conviction maintains firm hold. Correspondingly with regard to views of heaven. Many a pious person, richer in faith than in knowledge, confidently expects as a reward of virtuous life to inhabit literally and exactly a city with twelve gates which are twelve pearls, every several gate of one pearl and the street of the city of pure gold, as it were, transparent glass, with 'a pure river of water of life, clear as crystal, proceeding out of the throne of God and of the Lamb;' in the midst of the street of which and on either side of the river is the tree of life which bears twelve manner of fruit and yields her fruit every month. Beautiful as such figures may be, appealing, as very likely they do, to the best emotions, it is nevertheless extremely derogatory to human intelligence that they are ever allowed to usurp the place of science, claiming to be positive truth or assuming to be of any value in anybody's philosophy.

§ 59. The philosophy of imaginative, or highly emotional peoples, has often the same vicious tendency. Oriental speculations for this reason in great part have been worthless. The

oriental scarcely can speak without employing figures. When, therefore, he attempts to philosophise, he speedily envelops himself in a fog of tremendous and astonishing imaginings. Cosmogonies and theogonies of enormous absurdity obtain with him a ready credence and are gravely accepted as truth. Of all oriental philosophising, that which approached the nearest to scientific form and practical value, was the Arabian philosophy of the middle ages, but this can be traced definitely to Greek influence. In more modern times the German mystical speculations afford instances of the peculiarity we are considering. Swedenborg, Jacob Boehme, Jacobi, C. W. F. Schlegel, Schleiermacher, Schelling, and many others, exhibit in their writings the same difficulty which operates so unfailingly to oppress the oriental reasonings. Coleridge was by no means free from it. No poet who essays to philosophise can well prevent himself from placing before his mind poetical images as scientific truths. To close these remarks with a specific example—a curious case of the introduction of a figure as a scientific explanation of phenomena, is found in the works of a writer of the present day, who defines consciousness as 'the light of all our seeing.'[1] 'If instead of attempting to conceive consciousness,' remarks this author, 'as a distinct mental faculty, or in any way an agent putting forth specific exercises, we will consider it under the analogy of an inner illumination, we may both avoid many difficulties and gain some great advantages. . . . The conception is not of a faculty but of an illumination; not of a maker of phenomena but of a revealer of them as already made by the appropriate intellectual operation; and as thus constructed in the illuminated mental sphere they at once appear to the mind, and the fact of perception is consummated.'[2] That this theory explains nothing needs scarcely to be remarked. Indeed there is more necessity for an explanation of this 'inner illumination,' than of consciousness itself. That the former is a mere figure is evident, for in this instance the author cannot be accused of intending to insinuate any sort of materialistic hypothesis.

§ 60. Finally, it is always incumbent on us to be on our guard against tricks of language of every sort. There is as much dishonesty in the use of words as there is in actions. Unfortunately many persons who would shun a dishonest deed, make no scruple at all to delude by a false use of language, or to convince by a false argument even when they know it to be false. The

[1] Dr. L. P. Hickok. [2] *Empirical Psychology.*

exposure of fallacies of reasoning belongs to logic, and does not come within the scope of our present remarks, but there are some fallacies of statement which are worthy of mention here as frequently arising in discourse, and as tending to mislead. Those which we will cite are the Aristotelian fallacies *in dictione* and are six in number. A mere enumeration of them will be sufficient.

1. *Fallacia Equivocationis.* This is a fallacy which deceives by the use of an equivocal word; as *The President is the head of the nation; Vanderbilt is president; therefore Vanderbilt is the head of the nation.* Here the ambiguity lies in the word *president*, which in the first use means president of the United States, and in the second president of a railway company. *I have seen mosquitoes go up a tree and bark; I caught one hundred minnows and a good many of them would weigh a pound*, are other examples.

2. *Fallacia Amphiboliæ.* This arises from a doubtful construction, as where, for instance, it may not be certain to what antecedent a relative refers, or where it is not readily apparent whether a word is subject or object. An example of the first case is found in the proposition: *This is the house situated in the town of Lanesboro, in which my father dwelt*; of the second, in the Latin *Corpus sentit*, which may mean *The body feels* or *He feels the body.*

3. *Fallacia Compositionis.* This is seen when what is proposed in a divided sense is afterwards taken collectively; as *Two and three are even and odd; five is two and three; therefore five is even and odd.*

4. *Fallacia Divisionis.* This is the converse of the last and has been already alluded to (§ 56). It occurs when what is proposed in a collective, is afterwards taken in a divided sense; as *Five is one number; three and two are five; therefore three and two are one number.*

5. *Fallacia Accentus.* Here the same thing is fallaciously predicated of different terms, if they are only written or pronounced in the same way. Puns are examples of this fallacy, though sometimes they may be included under the first class named also, or perhaps exclusively.

6. *Fallacia Figuræ Dictionis.* This fallacy is exemplified in those cases where, from any similitude between two words, what is granted of one is by a forced application predicated of another;

as *A designing man is unworthy of confidence; this man has formed a design; therefore he is unworthy of confidence.*

These fallacies are very simple, and for the most part their exposure is not a perplexing matter. Extreme cases always exhibit the fallacy in the plainest terms, and from these, as examples or forms, the mind, thus warned that such sources of error exist, usually discovers the less obvious deceptions with no great difficulty.

CHAPTER V.

THE ORDER OF THE SCIENCES AND THE POSITION OF PSYCHOLOGY.

§ 1. THE fact that there are many sciences has been remarked already (Ch. I. § 8): it is now proper to note their relations to each other. The classification of the sciences is the province of philosophy, since the latter is itself the science of the sciences, and with this classification goes the full exposition of their mutual dependencies: but in order to ascertain what is the true position of psychology in the hierarchy we are obliged to observe in some measure the places of the others and their connections.

§ 2. That we may correctly locate psychology we must know what psychology is; and to us in pursuing this study it will be taken to be the Science of States of Consciousness. I expect that justification for this definition, and this application of terms will be found in the subsequent pages, and shall not argue questions relating thereto at this stage. As the word Psychology is ordinarily used in scientific literature it means the science of mental phenomena, science of mind, or of Ego manifestations, including both subjective phenomena or those observed by introspection and the objective phenomena of mind in general, wherever manifested, as observed by the same processes as we observe other facts of the Non-Ego world. Designating it as the Science of States of Consciousness does not alter its province, except maybe to give the greater prominence to what is usually termed subjective psychology, but defines better and specifies more exactly and expresses more clearly the character of the science.

§ 3. It is obvious then that Psychology is characteristically a science of those phenomena which are in the stream appertaining

to the Ego (Ch. III. § 3 ff). So far forth as the Ego is opposed to the Non-Ego, so far forth is psychology as an Ego-science opposed to those sciences which relate to the Non-Ego; and to the extent that there are mutual interactions and dependencies of Ego-phenomena and Non-Ego-phenomena, to such an extent are there mutual connections and relations between psychology and Non-Ego sciences. That there are such mutual interactions and dependencies of phenomena has already appeared and will still further be made manifest in the sequel.

§ 4. The sciences have been divided into Abstract and Concrete, and an intermediate division of Abstract-Concrete is sometimes made. The Abstract Sciences are those whose subject-matter is principally abstracted things, that is relations between phenomena which have been abstracted from the phenomena themselves; while the Concrete Sciences deal with the phenomena in the concrete. Logic and Pure Mathematics are abstract sciences; Zoology, Botany, and Biology are concrete sciences. Those using the class Abstract-Concrete include thereunder such sciences as Mechanics, Physics, and Chemistry.[1]

§ 5. The sciences have also been divided into Theoretical and Practical. The Theoretical sciences are those which collect and arrange the entire body of knowledge on a given subject irrespective of any specific end of action; the Practical sciences are those in which some end of action is chosen and knowledge selected and arranged with reference to that end. The primary end of a theoretical science is knowledge; that of a practical science is action. Practical sciences may properly be called scientific arts. Engineering, arboriculture, agriculture, mining, navigation are all practical sciences.

§ 6. Another classification creates six or seven fundamental or departmental sciences including all others, and from which all others are differentiated. These are arranged in an order proceeding from the simple to the complex and placing first those which contain knowledge necessary for understanding the succeeding ones, or which the succeeding ones presuppose. These departmental sciences are I. Logic; II. Mathematics; III. Mechanical Physics; IV. Molecular Physics; V. Chemistry; VI. Biology; VII. Psychology. From these sciences certain concrete or derived sciences are cut out; and these departmental

[1] This classification (including the Abstract-Concrete division) is Mr Herbert Spencer's. See *Classification of the Sciences*, 1864.

sciences with their derivatives embrace all known phenomena of Nature.[1]

§ 7. Sciences are also characterised as inductive or deductive, according as their method is the establishment of generalisations from the observation of individual instances or the extension of generalisations already made to new cases. The concrete sciences are characteristically inductive, the abstract deductive.

§ 8. In the classification given above in § 6 the position of Psychology is sufficiently indicated. With regard to the division into Theoretical and Practical, its location is under the former of the two. It is also a Concrete rather than an Abstract science, since its subject-matter is the concrete facts of mind or Ego-phenomena.

§ 9. So far as it is possible to separate the sciences into two grand divisions on the basis of the difference between Ego-phenomena and Non-Ego-phenomena, we have something like the following relative positions.

A. *Sciences relating primarily to the Extended—Non-Ego Sciences.*

I. Physics.

MOLAR PHYSICS, embracing

Abstract Sciences—Kinematics, the Science of Motion;
Statics, the Science of Forces in equilibrium;
Dynamics, the Science of Forces not in equilibrium;

Concrete Sciences—Mechanic Powers;
Hydrostatics and Hydrodynamics;
Aërostatics, Pneumatics, and Acoustics;
Astronomy;
Geogeny;

MOLECULAR PHYSICS, embracing

Abstract and Concrete relations in
Molecular Attractions;
Heat and Light;
Electricity and Magnetism;
Chemistry.

[1] This is Prof. Bain's. Cf. *Logic*, Deduction. The Comtian classification seems to me to be obsolete, and hence I do not specify it.

II. Biology.

Abstract Sciences—Vegetal Life in Structure and Function.
Animal Life " "

Concrete Sciences—Botany;
Zoology;
Human Anatomy;
Human Physiology.

B. *Sciences relating primarily to the Unextended—Ego Sciences.*

Theoretical Sciences.

I. *Sciences of Mind in its Relations to Itself: Mind as Singular.*

Abstract Sciences—Logic, the Science of Qualitative Inference;
Mathematics, the Science of Quantitative Inference;
Æsthetics, the Science of the Beautiful.

Concrete Sciences—Psychology, the Science of States of Consciousness;
Ethology, the Science of Character.

II. *Sciences of Mind in its Relations to other Minds.*

Mind as General.

The Science of Human Communication (Concrete).
Sociology (Concrete and Abstract).
History, Anthropology, Ethnology,
Theoretical Politics,
Theoretical Jurisprudence,
Ethics.

Practical Sciences.

I. Logic,
II. Mathematics,
III. Ethology,
IV. Education,
V. Politics,
VI. Law,
VII. Jurisprudence,
VIII. Ethics,
IX. Political Economy.

&c. &c.

§ 10. The foregoing classifications will suffice to show the position of Psychology in the hierarchy of the sciences. With

the establishment of a proper method of classifying the sciences, and the necessary discussions for that purpose, we have nothing to do. We have noted the most approved classifications existing, and added a special one for the special purposes of this work. It need only be said that there is no exclusive order of precedence or connection, and that every departmental science is in some measure dependent upon each of the others, while the mutual dependencies of the sciences generally are very numerous and complicated. These mutual interactions will receive illustration in our examination of the Data of Psychology, to which we have now come.

CHAPTER VI.

THE DATA OF PSYCHOLOGY.

§ 1. IF Psychology be the Science of States of Consciousness, a considerable portion of its data must necessarily lie within the range of the mental experience of the Ego. In truth no one knows any one's states of consciousness except his own: and whatever be affirmed or denied of a state of consciousness, will have no possible significance except as identified with some portion of the inner experience of the Ego. By the aid of memory the Ego is able to collect, compare, and co-ordinate his own states of consciousness. To that extent he may construct a science of his own states, and thus a purely subjective psychology. Making use of language, he can record his results and perpetuate his science. If then, every mind were thus to record its states, any one, by the understanding of language, which is a means both of recording and of communicating knowledge, could, out of the preserved accounts, verified by his own experience, form a science, not only of his own mental states, but of mental states in general so far as his data go.

§ 2. Now while no one, except it may be the psychologist, makes designedly a record of his states of consciousness available for science, it is true that every one is involuntarily making such a record all the while. And the reason is that states of consciousness are ever expressing themselves in action of some sort. I am conscious in myself of some thought, feeling, or volition, and I am aware of its expression in some action of my bodily organism;

when therefore I see in others a similar action of the bodily organism I infer a similar mental state. From such observed similarities of expression the psychological investigator can gather together materials for a science not solely of his states of consciousness but of such states in general wherever consciousness manifests itself as such to others' minds. A science of mind thus becomes possible. Moreover, though few make it their business to chronicle their mental states for scientific purposes, everybody finds it requisite in his course of life to express and place on record some of his mental states for some purposes. It is necessary all the time to be expressing thoughts, feelings, and volitions for some practical end or other and very frequently in such a manner as to preserve them. All the social arts and industries require this; the existence indeed of each individual demands it. Hence all speech and all literature, whether scientific or artistic, theoretical or practical, descriptive, dramatic, narrative, argumentative or hortatory, furnish material for a science of mind. The whole body of human discourse supplies data for a science of states of consciousness. And so also all the social relations furnish them.

§ 3. But these considerations regarding the expressions of mental states reveal also a much wider field within which to seek such data. For the fact that states of consciousness are declared through their expressions in the physical organism makes it evident that some account must be taken of that organism. One's own states are expressing themselves in the organism and the states of others are interpreted through corresponding expressions in their organisms. Besides in the experience of the Ego, affections of the bodily organism affect also states of consciousness Touch, taste, smell, sight and hearing, all of which are physical, have corresponding, concomitant, and resultant mental effects. From the dawn of self-consciousness, that which I call my mind has been known to me only in connection with that which I call my body. I think, feel, and will, in and through that body, and all of my mental experience has carried with it a physical experience.

§ 4. The dependence of psychology upon Human Physiology for some of its data is thus very clear. This latter science is a science of function, and as function is inseparable from structure for a full understanding of either, so Human Anatomy must also be resorted to by the psychologist. But in order to understand human anatomy and physiology, inasmuch as they are but departments in the more general science of life, the whole of Biology

opens before us. Not merely human life but the principles of all life must be ascertained, and the facts from which they are generalised must be appealed to in order to complete a psychological science. And this seems to be all the more imperative, when we observe that in the lower animals there are expressions indicative of some sort of feeling and intelligence, varying in character and degree, showing in a word that they too have some kind of consciousness. How far this resembles and how far it differs from human consciousness, and how their mental states compare with man's mental states, falls within the scope of psychological inquiry.

§ 5. We have, consequently, three great departments from which are drawn the data of psychology and making three great divisions of those data; first the Egoistic or Subjective data, secondly the Sociological, and thirdly the Biological. Self-consciousness furnishes one set of important facts. Sociology, in its departments of history and anthropology especially, and generally in everything which serves to chronicle the relations of human beings with each other, or to elucidate those relations in their mental aspects, supplies another group of facts also important and necessary. Biology completes the list with its facts, interpreting the phenomena of life in general, and specially of human life, in structure of the organism and in physiology, including a full exposition of the nervous system and also comprising the department of comparative psychology. Drawing its data from these reservoirs Psychology can make its generalisations and establish a science.

§ 6. Though we go to biology and sociology for some of the data of psychology, it is still true that the latter is a science of states of consciousness and that the biological and sociological data are of value only as they throw light upon such mental states. I say of value, meaning of course of value for psychology. Consciousness is a purely subjective experience. Eliminating from our science the facts revealed by subjective introspection we have left a department of biology so far as relates to the portion concerning the structures and functions of individual life and a department of sociology to the extent of the facts relating to the social life of mankind. When, however, we superadd to all these the facts of individual consciousness an entirely new and unique collection is brought forward. These give rise to and make the science of psychology and bestow upon it all the distinctive character it possesses. We can use the biological data, but still

we have nothing but biology till consciousness is considered; we can classify the sociological data, but without consciousness we have only sociology. But having marshalled the facts of subjective experience and brought them forward to be scientifically coordinated a new science indicates itself. They are not biological though related to other facts which belong to biology; they are not sociological though associated with sociological facts which assist in explaining and locating them; they are of a different order and cannot be marked better than by the term *psychological*. They are the characteristic psychological facts, and to these and to the scientific arrangement of them the objective facts of biology and sociology are subsidiary. We may take away from psychology the data obtained from objective examinations and we shall still have a science left, though an imperfect one; but remove the data reached by introspective observation and we have no more a science of psychology. Hence, though by reason of the prior considerations the principles of psychology are generalised from biological and sociological facts as forming part of the data of psychology, yet the science does not thereby become either biology or sociology but remains distinctively the Science of States of Consciousness.[1]

CHAPTER VII.

THE METHOD OF PSYCHOLOGY.

§ 1. IN accordance with the suggestions made in the last chapter it is possible to divide Psychology into Objective and Subjective, the latter including the results of introspection, the former the products of observation upon things outside of consciousness. But all the results of objective study are reducible either to phy-

[1] I am not in sympathy with Geo. H. Lewes's view maintained in his posthumous work, *The Study of Psychology*, that Psychology is simply a branch of Biology. The reasons for my dissent I have indicated in the text. Though Mind be associated with Life, it presents a different set of phenomena of a special character and commanding a separate treatment. There is no more reason for saying that Psychology is a part of Biology than that Biology is a branch of Physics. Organic nature may be a development from Inorganic nature, Mind may be a development from Life, but between Physics and Biology, Life and Mind, there are differences sufficient to warrant the formation of separate sciences, and indeed at each of those points to make grand divisions of the sciences. And as remarked, the distinctive characteristics of the psychological science lie in the presence of states of consciousness as material for science. Psychology may be esteemed to be differentiated or evolved from Biology, but is nevertheless a distinct science. Cf. Spencer's *Psychology*, Part I. Chap. VII.

sical conditions or to subjective laws as indicated by expressions of mental states in others than the Ego. These last are laws of states of consciousness and nothing other, however much objective data may have aided us in arriving at them. The rest are the circumstances and conditions of states of consciousness, necessary to be understood in order to understand mental states, but yet not by themselves yielding laws of such states. I conceive then that the division into objective and subjective psychology should be regarded as having reference to the method of arriving at the principles of that science and not be employed to mark a distinction of subject-matter. For objective psychology taken as a branch of science by itself is only biology, except it be made to cover the extrinsic observations on subjective states as revealed by language and other physical expressions Generally speaking however the term is not used with application to such observations as these, and if not there remain solely the biological data, furnishing laws of the conditions for and physical concomitants of states of consciousness rather than of those states themselves. Therefore, while recognising the employment of both an objective and a subjective method in psychology, I think it is more misleading than helpful to attempt the erection of two separate departments, the one of objective and the other of subjective psychology. The principles of the science are principles of psychology as a whole, but the data only are collected and arranged by objective and subjective methods.

§ 2. Consequently, so far as objective psychology means concomitant or antecedent physical states, I shall treat it as a part of biology showing some of the conditions of states of consciousness. Just as in biology, the influence of the forces of inorganic nature on life must be observed and estimated in order that the science may be complete, and thus cosmological, meteorological, and geological data are invoked to give generalisations which express the conditions of life; so in psychology, the relations of biological facts to mind must be noted in order that by showing the correspondences between life and mind the mutual connections of the two may be exhibited and the true position of mind in the universe may be more fully understood. And so far as objective psychology means the results of comparative study of the states of consciousness of numbers of people I shall not seek to separate those results from the conclusions obtained by introspection: nor do I deem it needful in enunciating a principle of mental action to point out

specifically in each case the part that the subjective and objective methods respectively bear in its establishment. While conceding and indeed maintaining that the principles of psychology are derived from objective and subjective data, I must regard them not as laws of the objective expressions of mind nor yet as laws of mind introspectively viewed but as laws of states of consciousness as determined *both* by introspective analysis and synthesis and by extrinsic observations.

§ 3. Since psychology claims to be a science, its method must be governed by the determination of what constitutes a science. This we reached in the opening chapter, wherein we found a science to be our knowledge of some subject expressed in general verified affirmations (ch. I. § 7). Having given our fields of data then, the method of psychology is obviously to observe and collect facts, and generalise therefrom, expressing our knowledge of those facts in the most general affirmations possible, not omitting to make frequent and careful verifications by again referring to the foundation facts of experience. If psychology be a science, the method of psychology is no other than the method of all science.

§ 4. From the circumstance that there are both subjective and objective data to be considered, the observation of facts is somewhat different in psychology from what it is in other sciences. It is still observation, but the facts themselves are not of the same sort altogether. I have already alluded to introspective observation, that is, observation of one's own states of consciousness, and shown its necessity in psychological science. It remains however to note that this introspection, though for the sake of distinguishing called subjective observation, is in reality objective; that is to say, the observation is made upon the facts of mind objectified *in* the mind in similar manner to observation made upon objects extrinsic. From the capacity of the mind which admits of this it follows that introspection, though upon invisible and intangible objects, is nevertheless true observation of facts and thus falls within the method of all science. The subsequent treatise will of course give us the details of mode in which this observation takes place.

§ 5. Observation of facts extrinsic to consciousness and observation of facts in consciousness are the primary processes of psychological science. There seems to be less room for experiment in this than in the physical sciences and yet experiment is by no means impossible. Introspective experiments may be performed by any student of mental states, as for instance in the production

of given states of emotion by reflection and the creation of volitions consequent thereupon. So also the effect of external conditions upon states of consciousness is susceptible of experiment. Climate, food, society, natural scenery, wines, narcotics—all have their effect upon mental states, and those effects can be ascertained and studied by experiment. But for the most part these experiments must be performed on oneself and there is hence not the facility for ascertaining by experiment the general operation of mental forces from a large number of instances, that there is in the other grand division of the sciences of determining the operation of physical forces by that method. I am inclined to believe that in psychology experiment is of its greatest value in verification, and that for primarily reaching laws of mental states recourse must chiefly be had to observation.

§ 6. The difference between extrinsic and introspective observation may very well be expressed by characterising the former as direct, and the latter reflective. The former is distinguished by a looking *outward*; perception is the typical process. On the contrary, the other is a looking *within*, the mind turning back upon itself and making itself the object of a sort of perception within. It brings up for review its past states and compares them, retains its present ones and analyses them, arranges them all in order for generalisation, and does the whole by a reflective process, the reverse exercise of the method by which it observes outward things. The whole method of introspective psychology is reflective. Reflection is necessary too, as will hereafter appear, for direct outward observation, for we are constantly referring what we see to what we know and have known; thus, calling upon the reflective processes to aid us in identifying, classifying, and generalising the things without, which the mind perceives. Indeed, it will appear that reflection is also necessary for perception itself, but we must not just here go too far into the consideration of such topics. It is enough to note the distinction between the method of direct observation and that of reflective, both being observation, but the one being distinctively outward, and the other inward observation.[1]

[1] I would here refer the reader to the remarkable work of Mr. Shadworth H. Hodgson, entitled *The Philosophy of Reflection*, for a full exposition of the office and position of reflection as a characteristic of consciousness. Mr. Hodgson founds upon it a method of Philosophy, and traces the course of the reflective processes with great amplitude and with valuable results for psychological purposes.

§ 7. To assume in this place to indicate to what extent inductive, and to what extent deductive methods are to be relied upon in psychology, would be premature; and thus, unless provisionally necessary, would be out of proper order, since psychological science itself is needed to explain both induction and deduction. It will be sufficient to premise that both methods must be pursued, for in order to establish a scientific knowledge of states of consciousness, we must reach general propositions from the observation of individual instances (which is induction), and we must also many times extend to new cases a general proposition once arrived at (and this is deduction).

§ 8. It is obvious that in psychological science, much attention must be bestowed upon analyses of states of consciousness. These states are extraordinarily complex, and to get at their elements the most patient and thorough analysis is required. In this science the analyses will be found to be a very conspicuous part of the method of investigation. To separate these often complex mental states into their simplest constituents, and then to observe the likeness and difference, with a view of generalising, is no inconsiderable or unimportant office of the psychologist in the prosecution of his work. Analysis, too, is necessary in the examination of the physical conditions for states of consciousness, especially in studying physiological functions; but the method of dealing with extrinsic facts is predominantly synthetical, though analysis is called upon also to detect the germs of mental life, find the inception of consciousness in general, and to examine mind in general to a considerable extent, as seen objectively in all its stages of development. Analysis and synthesis in psychology go hand in hand. 'The analysis which decomposes a total into several components, must always be followed by a synthesis which reconstructs the whole, and thus restoring all the suppressed conditions, reuniting what provisionally was separated, views the parts in the light reflected from the whole. No fact is explained by the enumeration or exhibition of its factors, as *isolated* elements; only by these in their combination and mutual dependence.'[1]

§ 9. Our special method in this work will be to begin with a general analysis of states of consciousness with the object of ascertaining their elements and observing what is implied or postulated in them, and what is distinctively characteristic of them. We shall then survey the material or physical conditions of states of

[1] Lewes's *Study of Psychology*, Chap. XI.

consciousness, after which we shall be prepared to trace the genesis of states of consciousness. We will then proceed with a more detailed examination of the development of states of consciousness considered first on their Cognitive, then on their Emotional, and then on their Volitional side. Having done thus much, there still remains a synthetical work of great importance, namely, to exhibit mental states as products of the operation of mental forces. Having studied the processes of mental action, we shall have to deal with the products in order to apprehend the relations of states of consciousness as wholes to each other, and to show mind as a whole in its influence upon other minds, and reflectively upon itself. This also furnishes a foundation for the other Ego sciences. Our task will be concluded with a consideration of the disintegration and dissolution of states of consciousness, and some remarks upon the connection of Mind and Body.

PART II.

STATES OF CONSCIOUSNESS CONSIDERED GENERALLY.

'But I have nothing more to say, replied Simmias, nor do I see any room for uncertainty, except that which arises necessarily out of the greatness of the subject and the feebleness of man, and which I cannot help feeling.

'Yes, Simmias, replied Socrates, that is well said; and more than that, first principles, even if they appear certain, should be carefully considered; and when they are satisfactorily ascertained, then, with a sort of hesitating confidence in human reason, you may, I think, follow the course of the argument.'

PLATO, *Phædo*, Jowett's Trans.

CHAPTER VIII.

THE THREEFOLD ASPECT OF STATES OF CONSCIOUSNESS.

§ 1. THE words *State of Consciousness* constitute a name marking an experience of the Ego. This name indicates a distinct unit of mental experience, and to each one's own experience reference must be had for an explanation of its meaning. States of Consciousness have three aspects which may be separated in thought and studied separately, but which in fact do not exist apart from each other. These aspects are described by the names *Feeling*, *Volition*, and *Cognition*. Before noting the general characteristics of States of Consciousness as wholes, it will be of advantage to examine in succession these three constituent attributes of such states.

FEELINGS.

§ 2. No other definition of a feeling can be given than that it is a mode of conscious experience and, as before, each one's own conscious experience must be appealed to for further account. The conscious experience of the prick of a pin, the sound of thunder, the surprise at an unexpected event, the pleasure of good news, the grief at the death of a friend—are examples of feeling. By some, *feeling* is held to be synonymous with state of mind or state of consciousness, and as including under it both cognitions and volitions. There seems, however, to be a marked distinction between the experience of pleasure at something, for instance, and the experience of cognition of that which gives the pleasure. This being the case, there is no advantage but many disadvantages in applying the name *feeling* to both these phenomena: for it would impose upon us the necessity of finding some name for the feeling of a feeling to match the word cognition as indicative of the phenomena of thought. But it is true that in our experience there is no feeling without cognition, and no cognition without feeling. When one is present the other is present, though

in a given state of consciousness there is usually a marked predominance of one over the other. From the feelings proceed all our pleasures and pains, enjoyment, disappointment, despair, hope, elation, depression, etc. Indeed, these are names of feelings, the names being of different degrees of generality.

§ 3. All feelings are accompanied by molecular change in the nervous system of the body. How this arises and in what sort of structure will appear more particularly in our examination of the conditions for states of consciousness. Waves of molecular motion occur concomitantly with feelings and agree with the latter in various particulars, as intensity, duration, and rhythm. Sometimes a particular feeling will appear to be initiated before the corresponding change, sometimes the reverse. Excitement of the nervous centres by outside means will produce a feeling; disturbances arising within the body will equally excite nervous change and occasion feeling. Hence there are to every feeling two sides—a mental side and a physical. On the side of the body there is nervous change, on the side of the mind feeling.

§ 4. Feelings are distinguishable by their difference from antecedent feelings and subsequent feelings. If there were no change there would be no feeling. We only appreciate the feeling cold by a transition from heat. Each feeling must occupy a place in consciousness sufficiently large to give it a marked individuality distinguishing it from adjacent feelings and being homogeneous during all its continuance. If it is decomposable into unlike parts which exist simultaneously or successively, it is not one feeling but two; if it is indistinguishable from something adjacent it is not one feeling but a part of one, and unless it persists appreciably, there is no experience of it at all.

§ 5. The intensity of feelings is greatest at their first full appreciation, growing less intense as they become more familiar, and finally dying away as others take their place, sometimes failing even when the exciting cause is still present. The shock of transition when the foot is first thrust into the hot water of the tub marks the greatest degree of feeling. Soon the flesh becomes accustomed to the sensation and the feeling loses its power. When the clothes are first put on in the morning their presence is noticed, but soon is not heeded. The first salvos of artillery in a battle make the greatest impression on the ear, while subsequently the roar excites little feeling. The first flush of joy is the most marked and the force of grief heaviest at the first blow.

§ 6. Feelings may be classified in sundry ways having reference to their physical side or their mental. As pointing to their nervous concomitant and referring directly to their point of origination they may be divided into

1. Peripherally-Initiated.
   (*a*) Epi-peripherally-initiated,
   (*b*) Ento-peripherally-initiated;
2. Centrally-Initiated.
   (*a*) Original,
   (*b*) Reproduced.
      (1) Reproduced Central.
      (2) Reproduced Peripheral.

The peripherally-initiated feelings comprise what are called sensations. When they arise from or with disturbances at the ends of nerves which lie on the outer surface of the body, that is upon the extreme periphery, they are termed epi-peripherally-initiated. When they arise from or with disturbances at the ends of nerves located within the body, they are termed ento-peripherally-initiated. This distinction, however, is only relative, for the nerves are distributed through all parts of the body and at all depths; hence it would be difficult to say where the outside ends and the inside begins. But the epi-peripherally-initiated imply an initiation in connection with agencies outside the body, while the other sub-class have reference to initiation in connection with agencies within. The first sub-class includes sensations of touch, sound, sight and others, the second embraces sensations of muscular tension, sensations attendant upon digestion and those attendant upon any abnormal condition of the body as to health. The centrally-initiated feelings are those whose concomitant nervous discharge is originated at the nervous centres. These comprise largely what are termed emotions. The one class is primarily centripetal and the other centrifugal.[1]

§ 7. There are decided advantages to be derived from using the terms here employed in preference to those formed from the words *sensation* and *emotion*. The former are new and descriptive simply of feelings raising no other implications and no questions. The word *sensation* carries with it some intellectual elements, while the word *emotion* raises a suspicion of will or volition, both of which connections it is often desirable to avoid in treating of

[1] H. Spencer.

feelings by themselves. Substantially the same facts, however, are designated or intended in both sets of terms, and the two are coincident except in the particulars which follow in the succeeding section.

§ 8. When a person feels joy over a particular event an impression is made upon him; that is to say, the joy persists and a corresponding nervous excitation persists for a longer or shorter period. Now when subsequently that joy is recalled to mind, together with the reproduced or represented cognition, there is reproduced in a fainter degree the feeling of joy. Accompanying this reproduced feeling is a less degree of nervous disturbance, probably through the same channels as when the original feeling arose. Again, when a pinch of the arm is remembered, there is associated with the representation a reproduction also in a very faint degree of the pain experienced when the arm was originally pinched. These examples illustrate the subdivision of centrally-initiated feelings into Original (or primary) and Reproduced (or secondary) feelings; and the latter into Reproduced-Central and Reproduced-Peripheral feelings. The reproduced-peripheral feelings cannot be called with propriety emotions; they are remembered sensations, or faint repetitions of sensations, yet originated centrally. It sometimes is the case that these reproduced feelings grow to equal in their intensity the original feelings, and are mistaken for the latter. This is observed in extraordinary determinations of blood to the nerve centres, occasioning a great amount of molecular change. Hallucinations where a person thinks he sees an object, though it be not really visible, have intense ideal feelings accompanying them which are mistaken for real. Sometimes the reproduced sensations will occasion and merge into original sensations. In connection with an erotic idea a reproduced erotic feeling will occasion in the sexual organs an actual repetition of the sensation. So with reproduced emotions; a remembered feeling of joy or sorrow, if its co-ordinate idea be kept before the mind with sufficient persistence, will become an actual, present, vivid feeling of joy or sorrow. That this last should be the case might be expected from a consideration of the fact that all centrally-initiated nervous excitation, original or reproduced, is indirect as compared with peripherally-initiated nervous excitation, and that of the former as of the latter there are all gradations which pass into each other insensibly. If there be a correspondence of feelings and nervous excitation, the greater ease with which reproduced emotions pass into original will be

more readily explicable, and the difficulty of sharp discrimination between them will be apprehended.

§ 9. The terms *real* and *ideal* as applied to feelings mark the distinction between the original and reproduced.

§ 10. Feelings may also be classified according to their psychological effect. This will give us three classes:

1. Pleasurable Feelings,
2. Painful Feelings,
3. Indifferent Feelings.

Very little need be said in explanation of this division. Examples of each of the first two classes will readily be supplied by every person. Sometimes feelings originally pleasurable become painful from too long continuance or from change of circumstances; thus some tickling sensations are at first agreeable but if the exciting cause is still present and acting, after a little time become intolerable. Feelings attendant upon conversing with an acquaintance are pleasurable, but if he grow coarse or rude, the conversation, if continued, becomes painful. It is equally true that feelings painful at their beginning change to pleasurable. Grief, in itself a painful feeling, often develops into a delight and a luxury. Many persons are unable to bear at first the taste of certain kinds of food (as tomatoes) but afterwards consume eagerly that for which their dislike was so marked. There are some feelings, however, which are neither pleasurable nor painful but indifferent.[1] Surprise, already instanced, is one example. This emotion may be attended either with pleasure or pain but often seems to be accompanied by neither. So of wonder; so of many bodily sensations, or even epi-peripheral feelings. Perhaps the larger part of our states of feeling are indifferent as regards pleasure and pain. But it must be observed that many if not all of these indifferent feelings may become pleasurable or painful according to circumstances. The sight of a house may awaken no sense of pleasure or of pain; but on another occasion, as after a search for it, the house when seen awakens a decidedly agreeable feeling, while on another a painful feeling may be excited. The feeling of pressure of the bedclothing upon the body is often indifferent, but sometimes becomes, as in a cold night, highly agreeable; and sometimes, as in disease, quite unendurable. Feelings often pass from one state into another. If a person after a walk seats himself in a common straight-backed chair, the first

[1] Cf. Bain's *Senses and Intellect*, Chap. I.; also *Emotions and Will*.

feelings attendant upon taking his seat are agreeable: they soon pass into indifference, and finally, after he has remained some time sitting, become positively painful. It appears then that feelings are pleasurable or painful in degrees varying from indifference to indefinite heights of intensity according to circumstances. And pleasures and pains are the products of feeling in general.

§ 11. Another classification of feelings is made, according to their degree of representativeness or complexity. Feelings do not occur in absolute simplicity; when what appears to be an experience of simple feeling is examined, it is found to be a complex made up of a greater or less number of other feelings; and we can never trace them back to the ultimate experience of each. In the feeling occasioned by the sight of a simple object as a book we have represented the feelings which touch produces although the object be beyond our reach. And as we pass on to the emotions, there is a vast complexity. But, although it may not be practicable with absolute definiteness to separate feelings into groups according to the extent of their complexity, yet we can broadly mark divisions which shade into each other insensibly.

According to such a method, then, feelings range themselves under one of two general heads, namely,

1. Presentative.
2. Representative.

Presentative feelings are our ordinary peripherally-originated feelings. Such are, for instance, the feeling of warmth from a stove, the hearing of a bird's song from the tree near me, the repletion of a meal, the pain from a cut or bruise. Representative feelings are those attendant upon represented cognitions, and are reproductions of experiences of feeling once had. They come under reproduced feelings. Centrally-originated feelings so far forth as they are original are presentative. The highest and most complex grades of representative feeling have been termed re-presentative. And as intermediate between presentative and representative feelings a division of presentative-representative feelings is sometimes made. This last class includes a great part of our emotions and comprises those feelings in which a sensation or group of sensations, or group of sensations and ideas, calls up a large aggregation or conglutination of represented sensations. The sight of the slaughter of an animal occasions a feeling of this sort where impressions are made upon the eyes and ears which recall

feelings of pain and distress to which similar impressions before have been antecedents. The proximity of fire to a burnt child is the cause of a feeling of this class; he dreads it because he has experienced pain from it before.

§ 12. An example of the most representative feelings is found in love between the sexes. Its complex nature is well illustrated by Herbert Spencer, whose description I will quote; 'This is habitually spoken of as if it were a simple feeling, whereas it is the most compound and therefore the most powerful of all the feelings. Added to the purely physical elements of it are first to be noticed those highly complex impressions produced by personal beauty; around which are aggregated a variety of pleasurable ideas, not in themselves amatory, but which have an organised relation to the amatory feeling. With this there is united the complex sentiment which we term affection—a sentiment which, as it can exist between those of the same sex, must be regarded as an independent sentiment, but one which is here greatly exalted. Then there is the sentiment of admiration, respect, or reverence, in itself one of considerable power, and which in this relation becomes in a high degree active. There comes next the feeling called love of approbation. To be preferred above all the world, and that by one admired above all others, is to have the love of approbation gratified in a degree passing every previous experience, especially as there is added that indirect gratification of it which results from the preference being witnessed by unconcerned persons. Further, the allied emotion of self-esteem comes into play. To have succeeded in gaining such attachment from and sway over another is a proof of power, which cannot fail agreeably to excite the *amour propre.* Yet again the proprietary feeling has its share in the general activity; there is the pleasure of possession—the two belong to each other. Once more, the relation allows of an extended liberty of action. Toward other persons a restrained behaviour is requisite. Round each there is a subtle boundary that may not be crossed—an individuality upon which none may trespass. But in this case the barriers are thrown down; and thus the love of unrestrained activity is gratified. Finally, there is an exaltation of the sympathies. Egoistic pleasures of all kinds are doubled by another's sympathetic participation; and the pleasures of another are added to the egoistic pleasures. Thus round the physical feeling forming the nucleus of the whole are gathered the feelings produced by personal beauty, that constituting simple

attachment, those of reverence, of love of approbation, of self-esteem, of property, of love of freedom, of sympathy. These, all greatly exalted and severally tending to reflect their excitements on one another, unite to form the mental state we call love. And as each one of them is itself comprehensive of multitudinous states of consciousness we may say that this passion fuses into an immense aggregate, most of the elementary excitations of which we are capable; and that hence results its irresistible power.'[1]

VOLITIONS.

§ 13. A volition is a determination to action and is considered an undecomposable element in mental phenomena. Mind not only feels but acts, puts forth energy for an end: and this putting forth energy for an end is complete volition. Volitions have reference to the body and its movements and to the mind and its phenomena, to the present time and to the future. They never occur independently of feelings but in connection with them and stimulated by them. A feeling of pleasure prompts the volition to continue the pleasure; a feeling of pain the volition to avoid the pain. The simpler feelings give rise to the simpler volitions; the more complex to the more complex. The more intense the feeling, the stronger the volition; the more slight and evanescent the feeling, the less powerful the volition. Volitions are purely mental phenomena; the putting forth of my arm is not a volition but the result of one. There are two elements in volitions, one a Selective and the other a Dynamic. The former expresses the power of choosing between alternatives, of adopting one course out of many, and is the intellectual element; the latter is the force or energy element. The dynamic element is attached to every feeling and the selective arises from the opposition of feelings.

§ 14. Like feelings, so volitions are accompanied by nervous changes in the body. This would follow from the fact that volitions occur only in connection with feelings, but volitions excite change of a different character from feelings. For action the nervous movement proceeds outward from the brain or spinal cord to the limbs, head or other parts to be set in motion; for feeling the movement passes inward to the centres. To anticipate what will be more specifically explained in another chapter it may be remarked that there are two distinct sets of nerves employed for these two movements—the one efferent nerves and the other

[1] *Principles of Psychology*, Part IV, Chap. VIII.

afferent, the former characteristically relating to volition and the latter to feeling. Now whenever the sets of nerves used in feeling are influenced the excitement of these afferent nerves excites also the efferent nerves in a greater or less degree, and tends to produce outward motion and action. Correspondingly, feeling is attended by volitional elements complex in proportion to the complexity of the feelings. It follows then that volitions are capable of reproduction in correspondence with the representation of feelings. When feelings are represented the nervous changes characteristic are reproduced in fainter degree; with them are reproduced the corresponding stimuli to the nerves employed in action; and parallel with these latter excitements arise the past volitions associated with the feelings present. As the feeling grows stronger the volition grows stronger; and as the feeling passes from ideal to real, so the volition may pass from ideal to real in case no antagonistic feeling arises.

§ 15. Where the dynamic element of volition occurs alone and without any consciousness of selection, the action resulting is not ordinarily deemed voluntary at all, but is spoken of as involuntary. It is still volitional, however. Reflex actions are extreme instances of this sort of action, as sneezing, breathing, the peristaltic movements of the intestines: so also we have in similar case automatic actions, as those of walking, those of a piano player fingering the keys in playing a well-known piece, those of a skilled mechanic in performing certain kinds of work. Correspondingly, if the selective element could be present to the exclusion of the dynamic there would be no action except the intellectual process. The two elements in volition vary with respect to each other; and in the proportion that the dynamic becomes ascendant, the action tends to grow involuntary.

§ 16. Classifications of volitions may be made exactly corresponding to classifications of feelings, since volitions are so closely connected with them; but to make classifications parallel to all the classifications of feelings would be of no especial utility, as in many cases they would be unintelligible without reference to feelings. Divisions may be made also according to psychological characteristics as connected with the intellect. Divisions are made too with reference to the ends of volitions; but these can be treated more advantageously in subsequent classifications of the products of volition than in classifications of volitions considered as component

parts of mental phenomena. We will here notice three classifications.

§ 17. Volitions may be classified according to their degree of representativeness and complexity. This classification corresponds to the classification of feelings according to their degree of representativeness. The division is as follows:

1. Original Volitions.
2. Reproduced Volitions.

Original volitions are those which arise in connection with presentative feelings, as upon the sight of a book the volition to take it in the hand. Reproduced volitions are the reproductions in fainter degree of original volitions which accompany represented feelings and form the completing element of our desires or aversions (desire involving a movement *toward* and aversion a movement *from*). They are often illustrated in facial expressions or movements of the body, as shrugs or shudders in recollections of objects exciting fear, the movements in the last case being the result of reproductions of the original volitions to avoid or remove the cause of fear. There is a representative element in all volitions. Volitions occur, for instance, in connection with presentative-representative feelings which are compounds of original and reproduced volition. To recur to the illustration before used—when the child is brought near the fire his volition to avoid it is a compound of the reproduced volitions of the time when he was burned, and the present volition to step back or to one side. Volitions are re-compounded, and occur in high degrees of representation with the most highly representative feelings. Love of property, involving a determination to possess property, exhibits a volition of great complexity, carrying with it many volitions arising from particular volitions associated and aggregated with particular feeling. These highly integrated volitions might be termed Re-Reproduced Volitions.

§ 18. It is evident in this case, as in that of feeling, that the divisions of this classification cannot be definitely marked out but are only relative. The divisions indicate broad belts shading into each other. It is difficult to determine how far a volition is original, and how far reproduced. Purely original volitions do not exist, except in those actions usually termed involuntary. Purpose implies some degree of representation. The intricate nature of the connection between feelings and feelings, volitions

and volitions, and feelings and volitions renders it hard to make separations.

§ 19. The foregoing classification both in the case of volitions and the similar one exhibited in feelings, and also when extended as it may be to cognitions, is more of scientific than practical value. Another is accordingly suggested, which shows some broadly-marked characteristics of volitions, irrespective of physical concomitants and sensational or emotional connections. Volitions may be divided into—

1. Volitions of Attention.
2. Volitions Immanent.
3. Volitions Expressed.

It is an act of will when the mind simply gives its attention to an object, a feeling, an idea, or train of ideas. Not always is attention voluntary just as action is not always voluntary, but oftentimes it is so, and is controlled by feelings of one sort and another. It is essential to what we term concentration of mind. Immanent volitions are those simple preferences which take their rise in the mind, but whose effect is not directly traceable. No immediate action results from them, so far as appears, but they are nevertheless volitions; they affect conduct and character in a greater or less degree. Expressed volitions are all volitions which are directly traceable into resultant actions.

§ 20. Volitions may also be divided into—

1. Governing Volitions.
2. Occasional Volitions.

Governing volitions are those general volitions which determine a man's character or life, and spring from the most highly representative feelings. Determinations to right conduct, to cultivate the mind, to live temperately, to acquire property, to practice a profession, to lead a literary life, are all of this class. Occasional volitions are those arising upon special occasions, as a volition to go to dinner, to take a seat, to speak, to give or to withhold something. These occasional volitions are sometimes in furtherance of and consequential from the governing volitions and sometimes in opposition thereto, or apparently in opposition. When occasional volitions are repeated frequently in opposition to the governing volition, the latter is weakened and may be entirely destroyed or changed, for a governing volition is only a complex of reproduced occasional volitions. Frequent illustration of this is seen in

human character, when a repetition of evil practices perverts and destroys.

COGNITIONS.

§ 21. If there were no other element of mental phenomena besides feeling and volition, we should not be able to accomplish any examination of either. The completing constituent wanted is cognition, the knowledge element of mind,—thought. This also is an indecomposable element and is never found absent from our consciousness. It does not occur without feeling and its exercise is attended with volition, though the volition and the feeling may be scarcely noticed. We have no experience of the one without the other. It is not always or often practicable to select from a train of thought particular cognition and say that a particular feeling and a particular volition attended this cognition, but as we examine the whole train we can see that at no time was feeling or volition absent. Cognitions have been defined as *the relations between feelings.*[1]

§ 22. The product of cognition is knowledge, and as different modes of cognition there appear all the intellectual processes—memory, abstraction, generalisation, imagination, judgment, ratiocination, except so far as the same are affected by feeling and volition. As before implied, cognitions occur in trains, and one cognition is distinguished from another, as there are differences between them. Only for the sake of completeness is it necessary to observe that since cognitions are always accompanied by feelings, and feelings are concomitant with nervous molecular changes, cognitions also are invariably accompanied by nervous action.

§ 23. Only one classification of cognitions will be presented at this stage of our study. The majority of classifications of cognitions are really of the products of cognition, or the different varieties of cognitions, and more advantageously can be considered in another place. The following, however, which corresponds to the divisions of feelings and volitions according to their degree of representativeness, is necessary in a general scientific consideration of cognitions. As in the former cases, so now the classification exhibits divisions which are not sharply defined, but which run into each other. Cognitions, then, are divided into—

1. Presentative.
2. Representative.

[1] H. Spencer.

Presentative Cognitions are cognitions present and continuing, in which the continuing present impression is the primary object of cognition; as the cognition of a present object before my eye or of a present pleasure or pain. Representative Cognitions are those in which the present impression is recognised as a representation of a former cognition, and is subsidiary to the original experience; as all recollections of experiences. There are all gradations of representation. A separate division is sometimes made of Presentative-representative Cognitions—those which arise in perception, when certain sensations are experienced, and these call up the representations of other sensations which have before accompanied those presented, as when we see the form and colour of an orange and are led to endow it with all its other qualities or attributes. The highest and most complex representations, called Re-representative Cognitions, are aggregates of representation, and include the most general ideas and combinations of ideas, as general and abstract truths, and the most involved operations and results of reasoning.[1]

§ 24. Classifications of things cognised, termed categories, especially those of Aristotle and Kant, have played a very important part in the history of philosophy. They are seldom, however, of much value for psychology, and to be fully understood a somewhat elaborate explanation is needed of the whole system of which they in each respective instance form a part. Accordingly they would not be of enough importance to warrant their insertion here; and whatever is to be said respecting them can better be deferred to later pages, their place being supplied by the results of a general analysis of states of consciousness soon to be made.

§ 25. We are now prepared to make a synthesis and again consider states of consciousness in their integrity. We have observed that feelings, volitions, and cognitions do not exist singly or apart from each other; that not only is there no break in the stream of feelings, the stream of volitions, and the stream of cognitions; but the three streams run beside each other and mingle with each other. No feeling is found without volition and cognition; no volition without cognition and feeling; no cognition without feeling and volition. The three are interwoven with each other inextricably; we can distinguish the threads but

[1] The divisions Presentative-Representative and Re-representative are more peculiarly Mr. H. Spencer's. I doubt if they can be retained to mark divisions, although of value for descriptive purposes.

cannot disentangle them. Hence we are justified in regarding the true unit of mental phenomena to be the State of Consciousness, and not a feeling, a volition or a cognition. Mental phenomena are in fact made up of aggregations and successions of states of consciousness, in which cognition, feeling, and volition are mingled in different degrees. While it is true that now cognition may be so predominant as to make the state characteristically an intellectual state and again centrally-initiated feeling so prominent as to make the condition an emotional state, yet the other elements are not wanting, but are necessary in order to understand fully the prevailing aspect and to give unity to the whole; to neglect the inferior elements is to content ourselves with an incomplete view of the mental state and may involve us in serious errors. Every mental state has a cognitive, emotional and volitional side, all of which must be examined in order to exhaust what there is to be learned about the phenomenon.

§ 26. Let us note in the next place the continuous succession of states of consciousness, now considered as wholes. There is never any interruption of consciousness, of which we are able to have any apprehension. Of course there is in sleep, and in swooning a break, but whatever it is we only infer an interruption of the normal course from external indications. In our waking and normal condition one state succeeds another uninterruptedly and we are conscious of the succession. Thought succeeds thought, feeling succeeds feeling, volition succeeds volition, and they succeed each other interactingly.

§ 27. The indefiniteness of states of consciousness is likewise to be remarked. There is extreme difficulty in defining their limits; indeed it is never the case that we can accurately determine when one state begins and another ends. They pass by degrees into each other, overlap one another and intermingle with each other. We can distinguish them by their differences and persisting identity, but cannot circumscribe them by any definite line of demarcation. In these states thought is by far the most definite element.

§ 28. There should also be noticed a tendency to agglutination, involution, and integration. They are perpetually growing together, becoming consolidated, and changing the respective proportions of their elements. Representation plays an important part in this process, bringing up former states and fragments of former states which coalesce and fuse, increasing immensely the complexity of

the whole. In many cases we can trace the changes and analyse states of consciousness into others prior and more ultimate, but we can never decompose them into anything more ultimate than a state of consciousness having its threefold aspect of feeling, volition and thought. In this fact of progressive integration is found an explanation of the increase of a person's knowledge. Consciousness seems to be made up of tracts composed of lesser tracts which are in all stages of consolidation. There is presentation added to representation and again as combined with it; and representation as modified by re-representation, going on to indefinite degrees.

§ 29. Further, states of consciousness in their progress are accompanied by corresponding nervous changes in the physical system, through which they are registered and expressed objectively.

CHAPTER IX.

THE GENERAL ANALYSIS OF STATES OF CONSCIOUSNESS.

§ 1. THE general analysis of states of consciousness brings out primarily and most prominently the threefold aspect of such states which have received exposition in the last chapter. Feeling, volition and cognition are three characteristic phases of states of consciousness differing from each other and yet closely bound up with each other in mental experience.

§ 2. But such analysis develops some further facts of general psychological value. These are facts respecting the relations of the object of consciousness to the conscious subject. Of *what* are we conscious, taken in the most general aspect? The word *consciousness* means primarily *a knowing with*. It is the abstract of *conscious*, and *conscious* implies a something which is conscious, a something of which it is conscious, and the consciousness itself. The word *consciousness* is used as a term referring or attributing something to a subject mind as appreciating it. What is this appreciation? In the first place let us notice our—

CONSCIOUSNESS OF DIFFERENCE.

§ 3. In every state of consciousness we are conscious of something differing from something. That A is not B, but different from

it is an experience as universal as it is early. The hand of the infant striking against its mother or against the pillow or bed-clothing gives a conscious experience of difference. Every name is given to distinguish an object from others, and the necessity arises from the phenomenal fact of a constant appreciation of difference as involved in our consciousness. *Tree, house, book, dog, bird, stone,* all name objects which have in the mind individuality, that is an integrity formed by a separation from other things. The apprehension of a distinction between feeling, volition, and cognition, the separation of one state of consciousness from another, implies as an original element of consciousness, a primitive experience of difference. The fundamental antithesis between the Ego and the Non-Ego, which we considered while examining the postulates of science in general (Chap. III. § 3), still further illustrates and confirms the truth. Every cognition of duality is a cognition of difference and there is no cognition at all which is not a cognition *by* something *of* something. Hence consciousness of difference is a universal element of states of consciousness. Consciousness implies experience of something not the same as something else. Subject and Object, Ego and Non-Ego, one as distinguished from two, and two as from three, feeling which is not-cognition and not-volition, cognition which is not-feeling and not-volition, and so forth—all exemplify the truth that in every moment of conscious experience as making up that experience there is consciousness of something differing from something.

§ 4. Let it be again noted specifically that this consciousness of difference exists as a consciousness of difference between the Ego and the Non-Ego, by which self distinguishes itself from all else, and also as a consciousness of difference in the various phenomena of mental life irrespective of any general synthesis. Two cognitions are apprehended as different, or two feelings, or two volitions. Moreover this difference may have relation to the present, past or future time. We are conscious of two present feelings as different and also of a present feeling as different from a past one; also as different from one imaged as to occur in the future, the ideas of time being concomitant with the feelings, cognitions, or cognitions of feelings which are compared.

CONSCIOUSNESS OF AGREEMENT.

§ 5. In every state of consciousness we are also conscious of something agreeing with something. That B is B, and that Beta

is like B is involved in every conscious state. We identify two feelings as similar, two cognitions as alike, and two sequences of cognitions or sensations as agreeing. Wherever we note an individual we imply a consciousness of agreement, for individuality demands consistency with self, that is, sameness with self. A tree or a stone is not a tree or a stone, in sooth loses all its individuality unless it remains before the mind as the same with itself. Identity of experience is a part of consciousness. Indeed we could have no consciousness of difference without implying a possible sameness or agreement. Feeling A is different from feeling B, that is, it is *not the same as* feeling B. *Same and different* are a pair of relative names, of which one implies the other, and in like manner the respective experiences which they mark mutually imply each other. The antithesis of the Ego and Non-Ego requires a consciousness of agreement as well as a consciousness of difference, for in order that there may be a comparison for the purpose of mutual exclusion even, both the Ego and the Non-Ego must respectively remain constant; each must be thought of as the same with itself. The Law of Consistency is also but another expression of the truth that every mental experience involves a consciousness of agreement; the same may be said, indeed, of all the postulates of science, but of this we shall have occasion to treat more fully a little farther on.

§ 6. The same considerations of time as we noticed in the case of consciousness of difference obtain here also. We identify a feeling, cognition, or volition as the same as one we had a moment ago, or as like one we had yesterday, or a year before, and we picture to ourselves feelings and volitions as likely to recur in the future.

§ 7. In this connection it may be well to notice the cognition of personal identity and individuality. What we call personal identity depends upon consciousness of agreement. The Ego of yesterday, of the last hour is the same as the Ego of to-day, of the present moment. We are conscious of an identity of self under all circumstances and at all times.

§ 8. There are all degrees of agreement and difference which conscious experience apprehends. Agreement itself is manifested constantly in the midst of difference. I say two dots are alike (● ●), meaning that they are similar; for that they are in some respects different is evident from the consideration that it is their difference which makes them two (cf. Chap. III. § 18). I remove

my eyes from the page, and in a moment bring them back. I say of each of the dots that it is the same dot I saw a moment ago, meaning that it is absolutely identical with the one I just saw; and as I look at one continuously, I say it is the same from moment to moment. Yet if it were not different from the whiteness of the surrounding paper, I should have no experience of it whatever; and now that it does appear, if it did not continue the same, I should be unable to say that it is different from the paper or from the other dot beside it. Consciousness of agreement and difference seem to be interwoven with each other inextricably in mental experience, and the two as correlated are fundamental constituents of every state of consciousness.

CONSCIOUSNESS OF TIME.

§ 9. In every state of consciousness we are conscious of something continuing and of something succeeding something. A feeling or a cognition continues, one moment of its continuance succeeds some other, and when the feeling or cognition ceases some other follows. Now duration and succession are two elements, and the only elements of time; hence a state of consciousness involves and implies a consciousness of time. That consciousness of time is not consciousness of agreement or difference is evident when we observe the fact that the cognition of time is necessary to the cognition of a consciousness of both agreement and difference. In order that there may be a consciousness of agreement or difference there must be two things between which there is agreement or difference, or at least two states or appearances of the same thing; but *two* involves succession there cannot be two things, unless there is one succeeding one—and succession, as we have just seen, is an element of time. Further, in order that two things may be pronounced the same or different, they must continue appreciably, for if they did not continue appreciably there would be nothing of which to predicate agreement or difference. It will thus be seen that a consciousness of time is inseparable from and necessary to a consciousness of agreement and difference. All mental experiences whatever carry with them the cognition of time past, present, and future. No thought, feeling, volition, no state or condition of consciousness exists, in which time, as duration or succession, is not presupposed.

§ 10. There is a form in which duration and succession occur,

which deserves mention. This is what is termed simultaneity, or less properly co-existence in time. This consciousness is analysable into the consciousness of agreement and difference, and of duration and succession. Two things appearing in consciousness together give the experience. Simultaneity differs from succession in the fact that the mind can reverse the order of succession at pleasure when two things are simultaneous in consciousness; in a succession this is not done. Simultaneity seems to me a primordial experience.

§ 11. It is proper to observe that there is no consciousness of a beginning in time or of an end in time. For to be conscious of a beginning in time, there must be a representation of a time when consciousness was not, that is a representation of what never could have come into consciousness; and to be conscious of an end of time would require that there should be a continuation of consciousness after consciousness had ceased, in order to be conscious of its termination—which is an absurdity. Consciousness does not directly represent itself as beginning or ending; there is consciousness simply of duration and succession as fundamental facts.

CONSCIOUSNESS OF REPRESENTATION.

§ 12. In every state of consciousness we are conscious of something as represented. If we have a feeling which we identify as the same with or similar to a feeling had in the past, there must be, in order to the accomplishment of such an identification, a reproduction or representation of such past feeling. For, that we may compare the two feelings the former must be represented, since otherwise we should be comparing a feeling now existing with a feeling past and gone and out of mind, a comparison of something with nothing, which is an absurdity. The earlier experience must be represented, that is brought again before the mind and cognised as an experience before had, or similar to such a past experience. A little reflection will show that this consciousness of representation is a necessary part of all conscious experience. We have seen that continuance and identity are essential characters of every state of consciousness. But there is no continuance or duration, cognisable as such, unless there is a thread running through the moments of the experience connecting the past with the present. As a second moment of a given feeling comes after a first, I identify the second which is present with the first which is past, and consciously

receive them as one and the same experience. But such an identification cannot be made unless there is a representation of the first moment. In the same way a third and a fourth moment follow after the first and second and are identified with them, the first and the second being represented and then the third and so on, and all are bound together by a continuous process of representation and identification. Just so soon as there is admitted a continuance or duration of a state of consciousness, just so soon representation and a consciousness of representation are postulated. But continuance or duration, as has been already shown, is so important an element in a state of consciousness that without it there is absolutely no consciousness at all.

§ 13. Still more plain does this truth appear from a consideration of personal identity. When I identify myself as the same Ego persisting through minutes, hours, days, and years, there are involved several distinct ideas, which I have or of which I am conscious, though they may be so blended as not to be thought of as distinct, unless I proceed to separate them out. These are —the cognition of self present as distinguished from not self; the idea of existing in time past and having a consciousness of self; the cognition of agreement between the two; and the reference of this cognition of agreement to self. The cognition of self-existing in time past and having a self-consciousness needs some further analysis. It can be separated into the cognition of a self-conscious being and the cognition, as a matter of belief, that such a being actually existed. We have here then, aside from consciousness of agreement, difference and time, a belief that my idea of self as existing in time past corresponds to the actual fact, and that I did exist. Thus it is that we are conscious of a representation of actual experiences. In the same manner in recognising a feeling as the same feeling I had yesterday, I have the idea of self present; of self having a feeling yesterday; consciousness of agreement between the two selves and the two feelings. Indeed, we could not have the idea of self at all unless we had a primordial consciousness of representation. My personal identity postulates that I be the same Ego, who had some specific experience or series of experiences, and which in order to be apprehended at all must be reproduced or represented. I cannot distinguish the presentations to my mind as having been actually made before, or in other words I cannot distinguish a past experience actual from a simple thought of that experience as

possible, by consciousness of agreement, difference, or time; there is in addition in the former case a belief that the experience actually occurred to me. The idea then of personal identity involves a consciousness of representation.

§ 14. Consciousness of representation may be a consciousness of the representation of an idea,[1] to which a sensation has given rise or the representation of an idea which has no immediate antecedent in a sensation. At the time when we take cognisance of a sensation, we take cognisance of it as a sensation; when we take cognisance of an idea we have cognisance of it as an idea with no sensation directly antecedent. When we come to representation we are conscious in each case of a representation of the entire mental phenomenon, *including the consciousness of agreement and difference existing at the original presentation*, by which we knew a sensation from an idea. There is occasioned thus a consciousness of a consciousness of agreement and difference. Sometimes the representation is imperfect and in that degree we confuse and confound.

§ 15. Consciousness of representation then is involved in all states of consciousness. Past feelings, volitions and cognitions are, as we say, consciously recalled as such, and this experience of representation it does not seem possible to decompose into anything more ultimate.

§ 16. It may be asked if there is not a consciousness of presentation as well as a consciousness of representation. The reply is that presentation is the state of consciousness itself. To say we have consciousness of presentation is not to give an element of a state of consciousness but to declare that we have a consciousness of consciousness. On analysing these presentations, which are states of consciousness, we find however as an essential constituent a re-consciousness which we are not able to explain except by itself. This is the consciousness of representation, and is to be assigned a place as an element of presentative consciousness.

CONSCIOUSNESS OF POWER.

§ 17. A distinction is drawn by Aristotle between two senses of the word *Power* and between these two as proper meanings of the word, which, though criticised by some philosophers, is nevertheless legitimate and useful. This distinction is between Active

[1] I use the word in this section as opposed to sensation.

Power and Passive Power, the former being an ability to make and the latter an ability to suffer change. The liability to be affected by a cause is called Passive Power, or by some, Susceptibility: while the causal efficiency is called Active Power. Thus much premised by way of elucidation of what is to follow, we are prepared to observe that consciousness of difference, of agreement, of time, and of representation, though all fundamental facts in the process of knowing, nevertheless do not give us all its ultimate characteristics. There is something more; still an unresolved element in the Ego. It is still *I* that am able to be conscious of difference, agreement, time, and representation. It is I that underlie and experience feelings, cognitions, and volitions samenesses, differences, successions, durations, and representations: in me all these experiences are united. I am the one *experiencing, suffering, receiving.* This consciousness is not supplied by what we have heretofore indicated and it cannot be analysed into anything more ultimate. Further, the Ego is conscious of an ability *actively to influence* its own states. The mind is conscious of a power to control in a greater or less degree its own trains of ideas, combine them, separate them and reproduce them. In the consciousness of representation we are conscious of a power in and of ourselves that represents. In whatever acts we do, in all mental efforts and operations we are conscious of a spontaneity, an energy, a power that moves, intends, purposes, wills.

§ 18. In all states of consciousness then is involved the notion of power either active or passive -power to receive impression or influence, and also power to re act and in its turn to influence. In all the fundamental characteristics, of which exposition has here been made, there is implied this consciousness of power. In consciousness of difference there is postulated a power to discern difference. The Ego is able to distinguish *this* from *that*: if such an ability did not exist there could be no consciousness of difference at all. The same fact is apparent with reference to consciousness of agreement and of time, and perhaps most strikingly of all in consciousness of representation. I am not only conscious of the representation but am conscious of the ability to represent; and when the representation takes place I am conscious of a power in myself which is representing.

§ 19. This consciousness of power does not imply a consciousness of either dependence or independence. It exists irrespective of any complications of freedom or necessity, liberty, fate, or

chance. I am conscious of power in volition whether the exercise of this power be or be not itself conditioned by antecedent trains of sensations or ideas; the volition still in any event carries with it and implies a consciousness of the exercise of power in and springing from the Ego.

§ 20. It does not seem possible to make a synthesis of the two modes, activity and passivity, in any other manner than to make them modes of power excluding each other. We cannot analyse either active power or passive power into anything else. Passivity and activity appear to be two sides of the same thing, analogous to static and dynamic force. We might call consciousness of power consciousness of self were it not for the fact that it does not constitute the whole self-consciousness, analysis revealing and the nature of states of consciousness requiring the other elements we have noticed. We might call it consciousness of force if we did not use the term *force* as applying to the Non-Ego, whereas this mental power excludes Non-Ego force in the primitive distinction between the Ego and the Non-Ego. Upon the whole there is no characterisation so appropriate as that of consciousness of power, by which to mark this remaining elemental constituent in knowing Ego phenomena.

§ 21. We find, therefore, as the result of the most general analysis of states of consciousness, five general expressions indicating the elements of our consciousness, namely consciousness of difference, of agreement, of time, of representation, and of power. As the analysis of the last chapter gave us feelings, volitions and cognitions — the subjective aspects of states of consciousness objectified; so in the present we have obtained the constituent elements of the process of consciousness—the *knowing*. No one of these can be analysed into anything else and each one of them implies and postulates the others. Difference implies agreement and the converse and both imply duration and succession. Equally duration and succession imply the two others and also representation. In its turn representation implies continuance and agreement and thus difference also and hence succession. We have just seen the necessity of postulating power and power is nothing except it be persistent: and if persistent it must be consistent with itself. It thus postulates continuance and agreement also and through them the others of the five elements.

CHAPTER X.

THE GENERAL SYNTHESIS OF STATES OF CONSCIOUSNESS.

§ 1. THE most general synthesis of states of consciousness of the individual Ego gives us what we term the *Mind* of that individual. A similar synthesis of all states of consciousness viewed by introspection and by outward observation develops as a result *Mind* in general. This name *Mind* is a general term indicating a unity of all states of consciousness of an Ego as in and appertaining to that Ego; and as extended to its most general signification it indicates a general unity of all these lesser unities. If I say *my* mind, I mean that I objectify all my states of consciousness, unite them in a general synthesis and refer them to a subject Ego. The expression *my mind* is often used as equivalent to Ego, and the words *mind* and *matter* are frequently employed to mark the same cognitions and the same oppositions as *Ego* and *Non-Ego*. There are some other words by which the unity of states of consciousness is characterised. One of these is the word *Person*; this signifies not merely mind but a being having mind. Of course the word *mind* connotes a being having mind, but *Person* seems to denote the being and connote mind. *Person* points to the Ego considered as purely objective, that is as a being like ourself, but *quasi* outside of ourself; while the word *Ego* itself directs the attention inward. *Person* is used more frequently as a descriptive word applied to the Ego than as an ultimate and independent term, probably because it has inferior and colloquial meanings which might confuse and cloud; as (to illustrate) in its use for the word *individual* to designate numerical cognitions in phrases like *I have seen three persons*; and also in its use for man in general, as *He is a peculiar person*. Another word to be noticed is *Soul*, by which we denote an Ego considered as objective and connote mind and the attribute of immortality. It is evident then that *soul* denotes the Ego regarded with reference to a believed future existence after the change we call death. As associated with this belief the term *Spirit* is brought to view. This latter word also denotes the Ego and connotes mind as an attribute of the Ego, together with the idea of its existence apart from and in the absence of a body. The word *spirit* has reference to the belief in a future existence and

adds the further idea of existence independent of a body. But inasmuch as we know nothing of Ego existence without a material body and have no experience of such an Ego without the accompaniment of physical conditions, we are, by the use of these last two names, making an assumption in regard to the Ego for which introspection certainly gives no data. It is only by a full and careful examination of states of consciousness under all their actual conditions that we can determine at all whether any such belief is a proper or warrantable one; and then even at best it can be only a matter of belief or expectation and is not inherent in and essential to the idea of an Ego, the idea of consciousness or of sentience. States of consciousness exist and are subjects of science, irrespective of any considerations of immortality. It is therefore unwise to make any unnecessary assumptions by the use of terms with such implications as belong to *Soul* and *Spirit.* The general unity of states of consciousness is hence best expressed by the word *Mind.* Psychology thus may be said to be the science of mind, and mind may be said to have its three functions of feeling, volition, and thought, and where these three exist there may be said to be a mind.

CHAPTER XI.

THE POSTULATES OF PSYCHOLOGY AND THEIR RELATIONS TO THE FUNDAMENTAL POSTULATES OF SCIENCE.

§ 1. IT is mind that studies mind; and what we know of mind is only our cognition of those things which in their synthesis make up mind. It is I that examine myself. I subject my own states and conditions, my feelings and thoughts to my mind's inspection, as I would a landscape, a flower, or an animal: but underneath all is *I.* It is now important to emphasise in respect to mind and mental phenomena the fact postulated at the very outset, that all knowledge implies a knower, a knowing, and a known—in other words a subject and an object and a relation between the two. Not less in the study of states of consciousness than in the study of external objects is it true that all we know of them and of their unity mind is of mind objectified. Nevertheless as thus objectified consciousness and mind are invariably made attributes of a subject mind which is their substance

—an Ego underlying all their phenomena. Although we apprehend Mind in its unity by a synthesis of states of consciousness, yet the subject mind is all the while postulated as the maker of the synthesis. A subject Ego is everywhere postulated for states of consciousness. Now the instant we attempt to examine and analyse this subject Ego, we objectify it and again there rises behind an objectified Ego, mind or consciousness, a subject which we have not reached. It hence appears that we cannot get the subject mind, or the subject Ego, the ultimate substance of states of consciousness before us at all for the purposes of examination and scientific knowledge. What we seek in that direction forever eludes our grasp. We cannot decompose the subject mind, or indeed think it at all, although we cannot think without postulating it. We ascribe to mind attributes and characteristics, which we predicate of mind as a whole, but by *mind* we mean the underlying subject or substance of mental phenomena. That is, we predicate of the subject mind certain facts, though as we look closely we discover that in the process we are making subject mind object mind and that there still lies behind a subject which we have not reached. Both language and thought utterly fail us in attempting either to give or to gain any idea whatever of the substance of mind. More, we are unable to bring it into thought. No exposition can effect this; no ingenuity of speech, reasoning or imagination can accomplish it. Subject mind we do not know, and cannot know: yet we cannot think without postulating it. Everything we say, everything we are conscious of presupposes it.

THE EGO AS SUBJECT.

§ 2. These considerations bring us to the first postulate of psychology, which is the following:—*All States of Consciousness imply and postulate a subject Ego, whose substance is unknown and unknowable, to which States of Consciousness are referred as attributes but which in the process of reference becomes objectified and becomes itself an attribute of a subject Ego which lies still beyond, and which ever eludes cognition though ever postulated for cognition.*

§ 3. In thus postulating a subject Ego we are obliged to obey a law of mental constitution requiring us in the act to objectify the subject mind in order to think of it at all; to introduce and hold up for the mind's contemplation and examination a symbol

of this subject mind, which is none other than a unity of consciousness formed by synthesis and generalisation. A distinct unity is thus formed which is regarded as substance, in which inhere all the lesser unities and differences indicated in states of consciousness. But the crystallisation of all mental phenomena around a posited subject Ego has other implications which we must now consider. So far as we have a consciousness which gives us an Ego as a unity, just so far do we also postulate a Non-Ego; for the erection of such a unity implies something from which it is separated and which is not that unity. An Ego implies and requires a Non-Ego. And further, as we examine states of consciousness there appear certain phenomena which as a fact we do not refer to an inward substance but to an outward. We distinguish a sensation from an idea. Impressions from without come into consciousness and are cognised as different from other experiences which appear to come up from within to meet those coming from without. All such intrinsic impressions we exclude from the synthesis which gives us mind and leads us back to the Ego. Now in like manner as a substantial ground for these mental or Ego-phenomena is postulated in a state of consciousness as appertaining to the *known*, so for such Non-Ego phenomena is postulated in a state of consciousness a substantial ground in a Non-Ego, as appertaining to that which is known.

THE SUBJECT NON-EGO.

§ 4. Hence we have a second postulate of psychology in the following:—*All States of Consciousness imply and postulate a subject Non-Ego as antithetical to and exclusive of the subject Ego and which furnishes a ground for the common synthesis of all things entering into consciousness (if such there be) which are distinguished by it from things of and belonging to the Ego.*

§ 5. We shall very soon have occasion in subsequent chapters to consider, so far as is necessary for a science of states of consciousness, the phenomena which relate to the Non-Ego; and until then we may be relieved from tracing their relations and from generalising those phenomena. It is sufficient to state that among the generalisations are *Force* and *Matter*. The common antithesis of *Mind* is *Matter*. There is a difference in the meanings of *Force* and *Matter*; and the generalisation which in respect to Non-Ego phenomena results in the idea *Force* has in respect to the Ego

phenomena a correspondent and correlative in the idea *Power*; this latter term presents an antithesis to and at the same time suggests an analogy with the term *Force*. If then we make use of these three sets of correlatives, *Mind-Matter*, *Power-Force*, *Ego-Non-Ego*, we shall express the diversities and analogies which are given by the highest generalisations of those phenomena we respectively call Ego-phenomena and Non-Ego-phenomena, and at the same time we shall correctly indicate the inevitable reference of these two sets of phenomena, each to its own postulated substance and subject, which does not come into states of consciousness at all but which is implied in all consciousness.

§ 6. It would seem then, since knowledge implies a *knower*, a *knowing*, and a *known*, that, inasmuch as the state of consciousness itself is *known* and thus distinguished from the *knower* and that which is not the *knower* is Non-Ego while the *knower* is Ego, that a subject Non-Ego must be postulated as underlying states of consciousness themselves. This difficulty has been already pointed out (Chap. III. § 8) and what explanation seems possible has been given. The data of psychology furnish us not merely with facts attained by introspection but also facts attained by outward observation; this outward observation is accomplished through sensations, and the sensation (a feeling peripherally-initiated (Chap. VIII. § 6)) is a mental phenomenon which is distinguished in consciousness as having a side relating to things outside of and not forming a part of states of consciousness. Between this series of phenomena and the series of internal phenomena, the mind draws a broad line of demarcation. The latter are considered as belonging to and of the Ego, though for the purposes of knowledge objectified and regarded *quasi* Non-Ego; while the former are distinguished as of and belonging to a subject Non-Ego. These are facts of mental constitution; however anomalous they may seem, they exist and the anomaly lies in the nature of mind itself and cannot be overcome by any skill of exposition.

THE REFLECTION OF CONSCIOUSNESS.

§ 7. *All averments respecting States of Consciousness postulate that there are such States of Consciousness which are themselves or may be made objects of cognition in all their conscious experiences.*

Of course in order that there may be a science of states of consciousness, there must be a knowledge of such states, and this

cannot be without a power of reflection by which the mind turns back upon itself and examines its own states, phenomena and conditions. This is what we term self-consciousness and depends upon representation.

THE COMPOSITION OF CONSCIOUSNESS.

§ 8. Having given a subject Ego as known and a subject Non-Ego underlying that which is known (except what is known reflectively which is regarded *quasi* Non-Ego but referred to the Ego), and having given also the postulate that states of consciousness are themselves objects of knowledge, we have one other postulate of psychology which relates to the process of consciousness itself or the relation subsisting between the knower and the known:

All States of Consciousness imply and postulate a consciousness of something differing from something, something agreeing with something; something continuing and something succeeding something; of something as represented; and of something receiving or suffering and something acting.

This expresses the results of the general analysis of the last chapter but one and need not be further discussed here (Chap. IX.).

§ 9. We have thus four postulates of psychology; *first*, the postulate of the Subject Ego; *secondly*, the postulate of the Subject Non-Ego; *thirdly*, the postulate of the Reflection of Consciousness; *fourthly*, the postulate of the Composition of Consciousness. In addition we have at the threshold of our science a description of States of Consciousness as having a threefold aspect of Feeling, Volition, and Cognition, each an indecomposable element of a state of consciousness and no one found without the others. We have also a general unity of states of consciousness, effected by a general synthesis, which we call *Mind* and which by the postulates is referred to a subject Ego and distinguished from the subject Non-Ego and its attributes. Having thus seen in a general way what is assumed and given at the outset, we can proceed with the details required by a psychological science, expecting to find in the detailed examination confirmation of the truths expressed in the postulates here advanced.

THE POSTULATES OF SCIENCE IN GENERAL.

§ 10. Before proceeding to study the conditions of states of consciousness it is desirable to recur to the fundamental postulates

of science which we considered in the Introduction (Chap. III.) and note the relations of the postulates of psychology to them. It will be seen at once that the first two psychological postulates just enunciated are but a re-statement of the first postulate of science in general, which expresses the Fundamental Antithesis of the Ego and the Non-Ego. And as we previously saw that this antithesis implied the Law of Consistency and that of Identification as well as the Uniformity of Nature (Chap III. § 24) we shall now have no difficulty in seeing that these three last-named laws are also implied as postulates of psychology and included in the latter. Moreover, consciousness of agreement is only an expression as applied to states of consciousness of the same truth, which stated generally is the Law of Consistency—*Whatever is, is.* And consciousness of agreement and difference together express the psychological phase of the Law of Identification; that law is a statement of what is meant by consciousness of agreement and difference, but made broad enough so as not only to cover mental states as such but all other objects of knowledge. Likewise in consciousness of time and representation taken in connection with agreement and difference we have a psychological expression, as related to psychological data, of the uniformity of nature (see Chap. III. § 17). For the fact that some past experience is represented and known as a representation of a past experience in every state of consciousness implies that what has been in the past will recur, varying only as circumstances vary; the fact that a thing agrees with itself in order that it may differ from another also implies the stability of nature; and the same truth is postulated in the continuance of anything whatever. Indeed, the very form of our postulates is a statement of the uniformity of nature, for they are general and stated as applying to *all* states of consciousness, which only means that as such states *have* been found to possess certain characteristics, so in the future, wherever such states are found, so far forth as they are similar they will be found to have the same characteristics; in other words, whatever cognition has been made in the past will recur and be repeated if the circumstances of the former cognition recur—and this is the Uniformity of Nature.

§ 11. It will also be seen that the truth of the law of nature's uniformity rests very peculiarly upon the psychological fact of representation; for unless we can represent the past we have no means of comparing the present with it or of predicting the future. We cannot say what has been in the past unless we have a power of

representation which brings up a past experience and enables us to know it as such. And unless we are able to represent the past, we are wholly unable to generalise and absolutely have no guide for the future.

§ 12. The fundamental postulates of science have, therefore, a very intimate connection with the postulates of psychology. Not only is there no contradiction between them, but they mutually imply each other and are in the main different expressions of the same truths, the psychological laws being in form suitable to cover the objects with which psychology deals and the more general laws being susceptible of application to all science whatsoever. The fundamental postulates of science as hereinbefore given *are* postulates of psychology to which are added the four postulates of this chapter as being special expressions adapted to psychological science. We will close this portion of our work with a recapitulation in tabular form of these universally assumed truths.

KNOWLEDGE IN GENERAL.

FUNDAMENTAL POSTULATES OF SCIENCE. (Chap. III.)

The Fundamental Antithesis.

First. Knowledge implies and cognises as distinct and mutually exclusive a self and not-self (Ego and Non-Ego), and manifestations of each.

The Law of Consistency.

Second. Whatever is, is.

A thing cannot at the same time both be and not be.

The Law of Nature's Uniformity.

Third. Whatever cognition has been made in the past will recur and be repeated, if the circumstances of the former cognition recur.

As circumstances vary so cognitions vary as respects sameness and difference.

The Law of Identification.

Fourth. Whatever objects of cognition or subjects (in a grammatical sense) of affirmation are alike; so far forth as they are like, they may be substituted the one for the other or used interchangeably, and whatever is affirmed of the one may be affirmed of the others.

Whatever objects of cognition or subjects (in a grammatical sense) of affirmation are different; so far forth as they are different, they cannot be used interchangeably, and nothing which is affirmed of the one can be affirmed of the others.

PSYCHOLOGICAL KNOWLEDGE.—THE SPECIAL POSTULATES OF PSYCHOLOGY.

The Law of the Subject Ego.

First. All States of Consciousness imply and postulate a subject Ego, whose substance is unknown and unknowable, to which States of Consciousness are referred as attributes but which in the process of reference becomes objectified and becomes itself an attribute of a subject Ego which lies still beyond and which ever eludes cognition though ever postulated for cognition.

The Law of the Subject Non-Ego.

Second. All States of Consciousness imply and postulate a subject Non-Ego as antithetical to and exclusive of the subject Ego and which furnishes a ground for the common synthesis of all things entering into consciousness (if such there be) which are distinguished by it from things of and belonging to the Ego.

The Law of Reflection.

Third. All statements respecting States of Consciousness postulate that there are such States of Consciousness which are themselves or may be made objects of cognition in all their conscious experiences.

The Composition of Consciousness.

Fourth. All States of Consciousness imply and postulate a consciousness of something differing from something; something agreeing with something; something continuing and something succeeding something; of something as represented; and of something receiving or suffering and something acting.

PART III.

THE MATERIAL CONDITIONS OF STATES OF CONSCIOUSNESS.

'I am about to speak of an illustrious philosophy, in which all things are said to be relative; you cannot rightly call anything by any name, such as great or small or heavy or light, for the great will be small and the heavy light—there is no one or some or any sort of nature, but out of motion and change and admixture all things are becoming.'—PLATO, *Theaetetus*, Jowett's Trans.

CHAPTER XII.

THE FUNDAMENTAL NOTIONS OF THE EXTERNAL WORLD.

§ 1. WE observed in a former chapter (Chap. VIII. § 29 *et ante*) that states of consciousness have concomitant and corresponding nervous changes in the physical system. The nervous organisation then furnishes us a subject for study as being among the material conditions of mental life the nearest and most immediate. Next, a nervous system is found only in an organism which we style a body: and to the human mind that organism which is of paramount interest is the human body. But the human body as furnishing a habitat or proximate environment of mind in active exercise is a living human body: and life it shares with other beings differing from it widely in structure and function. So the phenomena of organic life in general present themselves for examination in order that we may understand human life and with it nervous changes concomitant with mental manifestations. But life is dependent on the operation of inorganic forces creating conditions for vital existence. Back of organic nature lies inorganic nature. The latter has its general laws which unite its multifarious phenomena, and a scientific consideration of these phenomena carry the mind down to certain fundamental ideas or notions involved in all our experiences of the external world and which form the foundation stones of our edifice of knowledge of the Non-Ego.

§ 2. It will be of more service for us in studying the material conditions of states of consciousness to reverse the course our minds have just followed and begin with these fundamental notions and laws: thence proceeding from the more remote and general to the more proximate and special conditions. In doing this we shall be less likely to incur the reproach of attempting to prejudice, if we give no reason for it, leaving both the reasons and the consequent justification to the reader's own mind as the same shall be suggested in the sequel.

§ 3. Our knowledge of the external world is derived from our

sensations; or, as we have preferred to call them, feelings peripherally-initiated (Chap. VIII. § 6). The peripheral feelings of muscular pressure are admittedly among the earliest and as we shall hereafter show in fact are the earliest of our sensational experience; we will use these as types and samples, any one of this variety giving us all the elements of the experience of an external world. A certain effect is produced upon our consciousness which leads the mind toward a cause of that effect as being outside of consciousness. This effect we style an impact, perhaps, and its cause or the cause and effect together or either alone we term a *Thing*. Now by *thing* we mean a distinguishable persistence in consciousness with a subjacent ground in which it inheres as attribute in substance. That which sensation gives us then is a *thing*. But since there is an Ego subjacent ground and a Non-Ego subjacent ground, a centrally-initiated feeling is as much a thing as a peripherally originated; a cognition or a volition as much so as a sensation. Some limiting name must therefore be added. A similar difficulty occurs with the use of the word *object*. Sensation gives us experience of objects but so does representation; objects are of the internal as well as of the external world. The word *Body* supplies the need. A body is a thing of the external world, or if we anticipate a little, a *Material Thing*. Sensational experience gives us knowledge primarily of body. But this experience is not one of body as singular but of a plurality of bodies all having a synthesis in a common source or ground—the Non-Ego.

§ 4. To our experience bodies are of two kinds, which are revealed in experience together and never separately, which cannot be thought without implying each other but which are mutually exclusive. These are *Resisting Bodies* and *Non-Resisting Bodies*.[1] When the arm is put forth in movement and the hand strikes a surface, say the side of a wall, we have an experience of resistance to effort which is known by its difference from the want of resistance

[1] I am as keenly alive as any one of my readers can possibly be to the seeming absurdity of speaking of non-resisting bodies, and of characterising space as body. Nevertheless after the most patient and careful reflection extending over several years I am forced to adopt the views and expressions in the text. The reader who follows the course of exposition and the criticisms of the remainder of this and of the succeeding few chapters will, I trust, at least be able to appreciate how such a view as mine may possibly be tenable even if he cannot accept the conclusions to which I have been brought. Of course I do not claim that this view of space is accepted as settled science.

before the hand reached the wall and by the non-resistance laterally along the wall; there is resistance at one point or along one line and non-resistance all around; points of resistance in the midst of non-resistance make up one experience of an external world.

§ 5. The attribute by which non-resisting bodies are distinguished from resisting bodies is that of *capacity to receive extension.* Non-resisting bodies afford room for extension; resisting bodies so far forth as they are resisting negative extension. The two ideas of extension and resistance are mutually exclusive. Resistance is the opponent and extinguisher of extension while extension on its part is the destroyer of resistance. We are accustomed to say, to be sure, that a resisting surface is extended; but if the resistance were perfect and complete we should not know an extended surface at all. To use the former illustration, our hand would be enclosed as in a vice and we should only know resistances without being able to say there was a surface. We cannot know extension except by motion and that there may be motion there must be room within which to move; that there may be this room there is absolute need of non-resistance or the giving way of resistance.

§ 6. As a fact of experience resisting bodies never occur without the presence of non-resisting bodies. Resistance means non-extension; and extension means non-resistance; the two are opposite sides of the experiences of the external world. Resistance is an attribute of externality and so is extension; both find their synthesis in a substantial Non-Ego, of which they are modes. The Non-Ego as producing resistance gives us resisting bodies; the Non-Ego as extended gives non-resisting bodies. Indeed the two ideas of extension and resistance imply each other. For a resisting body is limited; the very notion of resistance is limitation: on the other hand this limitation gives a thing cut off from an unlimited extension. But equally extension implies non-extension and the moment we put a limit to the extension there arises the idea of resistance or opposition—one thing set over against or opposing another.

§ 7. Resisting bodies have the attribute of mobility or the capacity to move; non-resisting bodies have the attribute of immobility. *Motion* is the taking of a succession of positions by a resisting body with relation to some enduring or permanent body at *Rest.*

§ 8. Resisting bodies have the attribute of occupying or filling

non-resisting bodies. Occupying means simply taking a position of resistance to (against) some other body; filling means precisely the same thing—to occupy as against and to the exclusion of some other resisting body. On the other hand non-resisting bodies have the attribute of ability to be occupeid by resisting bodies. We might say that the non-resisting body was displaced were it not for the fact that this merely invests the latter with the attribute of an imagined resistance and still leaves extension behind. There is no more simple method of expressing the experience than that resisting body occupies non-resisting body; and this occupation gives us the notion of impenetrability.

§ 9. Resisting bodies from their attribute of resistance are termed *Forces*; non-resisting bodies from their attribute of receiving extension are termed *Spaces*. The entire aggregate of bodies is termed *Body* or *Matter*, whose defining characteristic is that of externality with reference to a perceiving mind. Matter, then, or Body, has its two attributes or modes of *Force* and *Space*. Force is the abstract of all forces; Space the abstract of all spaces. Matter as a whole is on the one side force: on the other space.

§ 10. As appears from what has already been said forces do not arise in our experience except as in space. We cannot think of force except as in space; nor can the notion of force subsist in consciousness without the notion of extension. For that there may be an experience of force at all there must be a greater or less persistence in consciousness; this persistence must be distinguishable and if distinguishable there must be something from which it is distinguished. This implies a bounding or circumscription of the persisting something; this circumscription if the persistence be ascribed to an external cause or source (which is the supposition) can be thought to be no other than a circumscription by an extended something; there must be space surrounding the thing and separating it from every other thing which can persist. Equally true is it that we cannot think of spaces except with the notion of force coming into consciousness. For that there may be a space at all there must be a force from which it is distinguished; and a space in order to be a space must be conceived as bounded. To conceive a space as unlimited is an impossibility of thought, and as a fact in experience it always is limited by a resistance. Whenever a limit is placed, therefore, in all directions we have a circumscribed space coherent and consistent, itself one thing as opposed to other things. But this notion of coherency and con-

sistency is no other than that of resistance. Hence when we define and describe a space we do so in terms of force. We erect the defined space into an imagined resisting body, but though we do this we are compelled still to think this body to be still in space. We think of a defined space in terms of resisting body but at the same time are unable to think it out of space. Thus reciprocally our experience of external things gives us forces which we think of as extended in space but which also exclude the notion of extension, and again spaces which we think of in terms of force as resisting but which, nevertheless, in their turn exclude the idea of resistance. A parallel to this is found in mental experience wherein states of consciousness disclose to us feelings, volitions, and cognitions which are three mutually exclusive experiences, but the relations of no one of which can be defined except by the others nor described except in terms implying the others.

§ 11. It is by a synthesis of these experiences of forces and spaces that we come to the notion of a totality of external things. The resisting bodies are associated together, and the spaces are associated together into one whole of space. A universe of resisting bodies all lying or contained in one immovable space is thus produced, for all of which we have the concrete name *Matter*, or *Body* with the two attributes of force and space—Force, the abstract of all resistances, Space, the abstract of all extensions. *Matter* in its turn is used as the name of an attribute, and a substantial reality lying behind matter is a necessity of thought. This we term the Non-Ego, which is the common ground of Matter, Force, and Space. It need scarcely be said that of this Non-Ego in itself we neither know anything nor can know anything. In fact we can only bring it into our cognition as an object beneath which as a subject there is necessarily still an unknown substance. As the subject mind eluded us, so now equally the subject Non-Ego, the subject of matter avoids our knowledge. Whatever generalisations and abstractions we make, whatever attributes we assign to this externality we are invariably brought around to the postulate of an unknowable subject Non-Ego postulated as antithetical to and exclusive of a similarly unknowable subject Ego.

§ 12. It will doubtless appear seriously questionable whether the term body can in any proper sense be applied either to a space or to space in general. But the perception of a resisting body

necessarily implies, so far as I am able to see, as a part of the perception a non-resistance; this latter is as much a sensation as resistance. It will not do to say that it is the absence of sensation, for the essential quality of the perception is of a giving way of resistance. Even when the arm is put forth before it meets the resistance of the wall, there is felt all the time the yielding of the resistance which comes from the dead weight of the arm itself. There are therefore, it would seem, two distinct and correlative sensations, the one of resistance and the other a vacation of resistance. Moreover greater and less as applied to resistance are not intelligible terms except on the supposition of a complete non-resistance as opposed to a resistance, a resistance wherever it occurs being then and there opposed to a non-resistance. I think we cannot escape from the conclusion that there is a sensation of non-resistance (that of extension) given with and distinguished from the sensation of resistance. If this be so then this non-resistance or vacation of resistance is a *thing* as much as is resistance and we are forced to elect between an Ego ground for it and a Non-Ego. Ascribing to it a sensational character of course places it among the manifestations of a Non-Ego. And since the term *body* or *matter* is given to the totality which result from a synthesis of these latter manifestations and is exclusive of Ego-phenomena, there is no good reason for refusing to stretch it so as to include spaces. If extension is a sensational experience it has its Non-Ego as well as its Ego side; and on the former it is material and forms an attribute of matter. Further, since there is in experience always a limitation to the vacation of resistance marking it as a distinct persistence in consciousness, it is a distinct thing both on its external and on its internal side. Inasmuch as it is a distinct thing and a *material* thing, it is legitimately entitled to be called a *body*. The fact that we thus seem to clothe this thing with the character of a resistance ought not to militate against such a designation; it only shows the inseparability of the two experiences of extension and resistance and their interdependence. Cognitions may be the relations between feelings, but they are none the less *things* with a distinct character in consciousness. If we are pleased to call spaces the relations between bodies, they are none the less bodies since they are separable phenomena of the external world and hence require a substantive ground in a Non-Ego. Neither is the fact that by long association we have coupled the idea of *body* with that of *resistance* a

sufficient reason for denying the application of the former term to space as well, when by so doing a great deal of confusion would evidently be avoided and the whole science of material nature be made more accurate and clear.

FORCES.

§ 13. Forces are presented under two aspects which claim early attention as being first suggested in connection with the notion of resistance itself, namely as *Impinging* and as *Resisting.* This gives rise to the distinction between Active and Passive Forces (*vis activa* or *vis motrix* and *vis passiva* or *vis inertiæ*). We do not have a resistance-sensation without something resisting and something resisted. Both of these notions are essential to the idea of a force, that is to say a force has the capacity of impinging and resisting and may be alternately the one and the other. In close connection with this distinction is that between forces *in motion* and *forces at rest.* An impinging force is a force in motion; a resisting force is a force at rest or a force tending to abate the motion of another force. A ball may strike another ball and set the latter in motion, but this latter is notwithstanding its motion still continually offering resistance to that which strikes it. Out of these distinctions spring two general notions as aspects of forces, namely Forces Dynamical and Forces Statical. The former are forces tending toward the origination and perpetuation of motion; the latter those forces tending toward rest. Dynamical forces may also be defined as forces not in equilibrium, static forces as those which are in equilibrium. It will be seen that these designations have applications to forces merely as related to each other in the alternative aspects of impact and impact resisted and of consequent motion and rest. The same force may be now dynamic and now static. It may be both at the same time: as related to the force behind it may be static while dynamic as to the force in front. So long as the equilibrium is maintained two forces are static; when through the increment of one the equilibrium is destroyed one or both may become dynamic. The same force with reference to other forces may be dynamic while with reference to its own parts it is static. Indeed we seem to have no experience of forces which does not give at once static and dynamic aspects as belonging to each force.

§ 14. The primitive sensation of resistance gives two other aspects of forces which are as much involved in the notion of force

as are the foregoing pair. Resistance operates both ways, and is a resistance both to impinging force pressing inward and to rending force pulling outward. On the dynamical side, therefore, forces are *Co-attractive* and *Repulsive*. On the statical side the same relation may be expressed by the terms *Aggregative* and *Separative*. We have no notion of any force which is not attractive and repulsive. Of attraction there are two principal varieties, *Gravity* and *Cohesion*. Gravity is the co-attraction of separate forces in general; cohesion is the co-attraction of the parts of one particular force to make a consistent whole. Repulsion on the other hand presents two varieties, that of *Relative Compressibility*, and *Relative Resiliency*. On the statical side we have the indefinite aggregation or accumulation of forces, exhibiting masses or magnitudes, and on the other hand the indefinite divisibility or separability of forces producing molecules and minitudes; and the two giving rise to the relations of greater and less.

§ 15. The foregoing two sets of attributes indicate the chief and most general relations of forces to each other. The relations of forces to spaces have been already shown in our exposition of the distinctive characters of forces, they being by these characters separated from spaces. The relations of forces to each other just given are not relations independent of spaces, since spaces and forces are always presented together, and our idea of a force is of a something in space and of a space as something containing forces: but they are relations wherein the inter-force connections and differences are more prominent. There is another general class of relations in which the relations of forces with forces and of forces with spaces are about equally noticeable. The first of these are the relations of *Sequence*, and in the second place and in close connection come the relations of *Co-existence*. Forces follow one another in experience and they also co-exist with one another. The notion of sequence involves that of a series of forces moving in a space. There is a permanent immobility represented by the notion of space and in this space one force moving away from another and toward another. Bodies appear in a dynamical aspect in this relation. The relation of co-existence is a statical relation. A plurality of forces at rest separated by spaces is what is involved in the notion. This is given in every original experience of resistance. I am unable to see how co-existence can be resolved into sequence, for the notion of co-existence implies at least two and perhaps three statical bodies, bodies remaining at one with themselves, *persisting* or standing while the experience lasts; sequence

carries the notion of bodies in their dynamical aspect, which so far forth as it is dynamical excludes the statical; bodies in motion following one another. When the outstretched hand strikes the wall there is given a co-existence of the impinging and resisting bodies, the essence of which is its statical character. As either the hand or the object against it *moves* new resistances and non-resistances *follow*, which give sequence. Sequences cannot be reversed; in co-existences motion can go from one to the other and backward showing a permanence which is antithetical to and exclusive of the motion experiences. Both co-existence and sequence are relations of forces in spaces dependent respectively upon statical and dynamical aspects of forces and also upon the mobility of forces and the immobility of spaces as they are related to each other in the material world.

§ 16. Forces as statical in spaces have with relation to each other *Position* or *Situation*. In order to determine position there is required a co-existence of separable things. The collocations of separable resisting bodies in the midst of spaces give magnitudes linear, superficial and solid, lengths, breadths, and thicknesses. A *line* is the limitation of extension by co-existent positions of resisting body taken consecutively between two terminal positions.[1] A *Surface* is the limitation of extension by co-existent positions taken between three or more intersecting lines. A *Solid* is the limitation of extension by co-existing positions taken between four or more intersecting surfaces. The defining lines and surfaces of a body give its *Figure*. All of these statical attributes of forces are known by motion in space, though simple co-existence seems necessary for the idea of motion. Extension along any one line gives us length; extension from one bounding line of a surface to another and within the surface gives breadth; extension from one surface of a solid through to another surface gives thickness. In a line length only is considered; in a surface length and breadth only; in a solid all three dimensions. These dimensions so-called are dimensions of co-existing consistent forces in space. In connection with solidity are the notions of *Mass* and *Density*. The *Mass* is the collective force of a resisting body shown by its degree of resistance at rest and its degree of momentum when moving at a given rate. *Density* is the degree of space concentration; a given power of resistance with a smaller bulk is greater density.[2]

[1] A curved line is made up of straight lines.

[2] Bain's *Logic*, Induction, p. 223.

§ 17. Forces for the purposes of science may be divided naturally into three grand divisions:

1. Molar Forces.
2. Molecular Forces.
3. Vital Forces.

Molar Forces are those wherein masses are exhibited at rest and in motion. Molecular Forces are those exhibiting molecules at rest and in motion. Vital forces are those exhibiting assimilations and organic connections. These divisions are only relative and reveal no differences in kind so as to create mutual exclusion. By some vital forces are ranked as a variety of molecular forces. In all the three, forces preserve their double characters as Statical and Dynamical, Co-attractive and Repulsive, Consecutive and Coexistent.

SPACES.

§ 18. As already named, the distinguishing character of spaces is the negation of resistance to motion. A space is room (*raum*) for movement. Its chief attribute is therefore seemingly a negative one, which, however, we are compelled to think as positive and to which we are obliged to assign a consistency in order to give any distinguishing consistency to a force.

§ 19. Spaces, we have observed, have the further distinguishing quality of containing forces. They have also the quality of immobility or of incapacity to move. They are not at rest, for *rest* implies the capacity to move or be moved; they are immobile, and the term *motion* is irrelevant to them except as to their ability to contain motion, and then it must be said that they contain *rest* as well. These three attributes express the chief and fundamental relations of spaces to forces, which I have deemed best to recapitulate because of the unfamiliarity which the reader probably has with the views of the import of the terms *space* and *force* which are here presented. Spaces may be further defined by the negation of other attributes of forces, but non-resistance and immobility include all these other negations.

§ 20. Spaces are limited by resisting bodies and only limited in that way. A space is defined by lines and surfaces of resisting bodies which thus make a demarcation of one space from another. Abstracting the notion of resistance there is no limitation of space. But as thus defined spaces may even be described in terms of

forces and spoken of as angular, circular, quadrilateral, hexagonal and so forth. By such descriptions we erect spaces in our thought into consistent wholes with attributes of force.

§ 21. There are two attributes of spaces in their relations to each other which are peculiar and of importance. These like other attributes of spaces must be expressed in terms of force, which are derived from forces and which suggest and imply the very qualities they negative. We are compelled to this use because language affords no other terms, and for a deeper reason which we shall notice a little later. Spaces are negatives which we are obliged to think as positives also and to describe and define in terms which express the positives they are employed to negative. As illustrating this truth nothing is more pertinent than the names of the attributes to which we have now come. Spaces are *exhaustively confluent*; that is to say when a resisting object is moved the space left behind flows into the contiguous spaces without leaving any residuum. Spaces are immovable, and when the separating forces are removed they are consolidated in a manner which we can only think of as motion and yet which is not motion because there is nothing moved. Space is left when the resistances are moved and this space at once becomes merged in the surrounding spaces. There is no better way of expressing this phenomenon than by the figure of confluence and yet the existing and resulting permanence negatives motion.

§ 22. Conversely, spaces are *exhaustively divisible*. When a resisting body occupies space it divides it into portions, but leaves no residuum. The portion of space occupied is taken out from space and still is in space. There is no way of simplifying this phenomenon; it is involved in the meaning of space-filling and is a matter of primordial experience, the nature of which we cannot understand and which any way we choose to state the problem involves a contradiction. The only way in which we can make an approach to understanding it is by a reference to the subjective phenomena of which it is the other side. 'When Aristotle says, Every continuous quantity, whether of time, space, or motion, is divisible into portions which are again divisible into other portions and so on for ever, he assumes the fact of divisibility without a residuum in the sense in which it is here intended; by the division of a continuous quantity he means its division into two or more portions which are exhaustive of the whole, without waste, so to speak, in the section. This divisibility arises from the changes in

sensation, in the objects of perception, time and space being united with a material element in cognition; and its being done without waste or residuum is due to no other cause than this, that the change of which we are conscious from one sensation to another occupies not two moments of consciousness but one, a moment, as we call it, empirically indivisible, no moment intervening between the two sensations which is occupied by neither of them.'[1]

§ 23. Spaces also are co-existent. As they are separated and defined by forces, two defined spaces may be apprehended simultaneously. They are hence on the material side co-existent. There could be little utility in regarding spaces as consecutive; the latter term as applied to forces is characteristic and sufficient; if attached to spaces it would be misleading, though spaces as bound up with forces may be said to be consecutive also. But co-existence as opposed to sequence, immobility as opposed to mobility are essential attributes of spaces.

§ 24. The word *extension* means unresisted motion. This implies a permanent substance in which the motion occurs and consecutive forces in this permanent. We may then apply *extension* to this permanent substance or to the motion in the permanent. We can hence say that the static substance is extended or that the force is extended. Properly, I think, the term belongs to the latter; it is a term of force and yet as distinguishing a non-resistance from a resistance the need of a positive term to express this exclusion of resistance has occasioned the application of the name to the space which is room for movement and allows motion. A space then may be said to be an *extension*, but in order to present the ideas involved distinctly, the terms *occupied extension* and *unoccupied extension* are preferable when it is desired to indicate the notion of unresisted motion in statical relations. As showing the two aspects of experiences of an external

[1] Hodgson, *Time and Space*, p. 181 (Part I. Chap. II. § 16). Mr Hodgson's exposition of the exhaustive confluence and exhaustive divisibility of space seems to me to be a very valuable one, as pointing out in strikingly felicitous terms two peculiarities of space which have been a stumbling-block to metaphysicians. The apparent contradictions involved in the language used respecting space here and elsewhere are not removable by words, but are founded upon experiences, and are necessitated by the constitution of the human mind. It is no disgrace to psychology to present contradictory propositions, the only thing to be considered is whether these contradictions represent truly facts in nature which inevitably originate contradictions, and the limitations of human knowledge develop many such. If we may not be able to explain natural facts, we have done our work when we have photographed them.

world *spaces* and *forces* are, it seems to me, the most useful designations. There is a complete analogy between the notion of *extension* as appertaining to the Non-Ego and *time* as belonging to the Ego experience. Time involves the idea of a permanent duration in which successions take place: the successions are time and the durations are time in like manner as space is extension and motion is extension, the two notions in each case implying each other. This correspondence we shall doubtless have further occasion to notice.

§ 25. We find, therefore, as the fundamental notions of the external world Forces and Spaces carrying with them these unanalysable and indecomposable aspects: Forces as occupying spaces and spaces as containing forces; forces as resisting and spaces as non-resisting; forces as mobile and spaces as immobile; forces as limited by each other and as limiting spaces; forces as related to each other exhibiting impact and resistance, motion and rest, coattraction and repulsion, co-existence and sequence; spaces with relation to each other being co-existent, exhaustively confluent and exhaustively divisible.

CHAPTER XIII.

THE GENERAL ANALYSIS OF EXTERNAL THINGS.

§ 1. OUR analysis of the phenomena of the external world having given us certain fundamental experiences which when generalised form notions of the Non-Ego covering the Non-Ego side of sensations and the things which give rise to those sensations, we have already before us Forces and Spaces in various relations as the material things which are the objects of knowledge lying outside the mind and a study of which gives the science of the external. Forces and spaces fill the same category in such a science as feelings, cognitions, and volitions do in psychological science. But as with respect to the latter we found it necessary to pursue our general analysis of states of consciousness to the extent of ascertaining and expressing the relations of the ego objects of consciousness with the conscious subject, and with each other, thus getting at the constituent elements of *the knowing* ego objects, so now it still remains for us in like manner to examine into and if possible indicate the relations of these non-ego objects of conscious-

ness to each other *and* to the conscious subject, or, in other words, to develop the constituent elements of knowing non-ego objects. When we know forces and spaces with relation to each other and to the subject known, of what in their most general expressions do these relations consist? Having given as data the things known in the external world, what are the most elementary relations of those things to the conscious subject and to each other?

RELATIVITY.

§ 2. I have said that by a *thing* we mean a distinguishable persistence in consciousness with a subjacent ground of inherence (Chap. XII. § 3). As this is true of a thing generally so is it true of a material thing. By distinguishable we mean separated or separable. Now none of these words have any meaning except in view of something from which a separation is made. Thus the cognition of a material thing or body carries with it as a part of the cognition of the body itself another body to which it stands related by difference. The individuality of the body itself depends upon it being cut out of or off something else; otherwise we have something standing in relation to nothing, which is an impossibility of thought. A resisting body implies a non-resisting body; a body at rest a body in motion and conversely. As a matter of fact our earliest experiences and all our experiences of the external world are experiences of a plurality of things which are in one way or another related to each other. Yet even if there were only one, still that body would be related to another *thing*, albeit a mental thing, and we should at once be brought down to the fundamental discrimination by the Ego of itself from the Non-Ego, which is the very beginning of all knowledge. But our notion of a body implies not merely a perceiving subject but other material objects. Analyse as closely and as profoundly as we will we cannot eradicate from the notion of a body wherever it occurs another related body. Corresponding then to consciousness of difference as an essential element of a state of consciousness (Chap. IX. § 3) our general analysis of the elements of the phenomena of the Non-Ego, gives as a universal attribute of bodies, *Relativity*.

CONSISTENCY.

§ 3. There can be no body to be related to another unless that body maintains its identity. The persistence of a distinguishable

thing means, if it means anything at all, that the thing consists with itself. To be different from something else implies a remaining at one with self. While the experience of body lasts as one experience distinguished from another, before or after or co-existent, it is of body agreeing with itself, of one and the same body. If it is in any wise a body, a thing and not nothing, it is consistent. Knowledge would vanish, nay things themselves would fly into the highest conceivable emptiness of emptiness were it not so. Corresponding to consciousness of agreement as an unfailing quality of states of consciousness (Chap. IX. § 5) we find here as an essential attribute of material things, *Consistency*.

EXTENSION.

§ 4. We have already noted the implication in the word *Extension* of a permanent substance in which motion occurs and sequence or motion in this permanent (Chap. XII. § 24). We have thus two modes of extension, permanence or statical persistence and transition, motion or sequence. The attribute of relativity implies a transition or change from one consistent thing to another, or a sequence of consistent things. And that bodies may consist at all they must be persistent or remain. Hence relativity and consistency postulate motion or sequence and permanence or statical persistence. If there be two bodies there must be a first and a second, even though the first become second and the second first; and if there be bodies at all they must each persist or remain, while the experience continues. In like manner motion implies relativity and consistency, since there must be some consistent thing to be moved and an alteration of position which means nothing except with reference to some thing or things with regard to which the position is altered. We see therefore that the two attributes we have observed in the preceding sections postulate also *extension* in two modes which mutually exclude and still imply each other, namely, *permanence* or *statical persistence* and *motion* or *sequence*. We cannot analyse these notions into each other or into anything else. There is no term that will explain sequence or motion and no more ultimate experience to be named. Relativity is not sequence though postulating sequence and consistency is not space permanence though implying it. To recur to the parallel experience with Ego phenomena;—agreement and difference, duration and succession all postulate one another but cannot be analysed into each other. It is the same with Non-Ego phenomena.

As states of consciousness must *endure* that their likenesses and differences may be appreciable, so material things must *remain* that their consistencies and relativities may be perceived. And as states of consciousness must *succeed* each other that there may be any differences observed, so there must be a sequence of material things that relations may be perceived. And as succession implies an enduring something to succeed some other enduring thing, so sequence implies transition from one permanence to another. Again, as duration postulates a succession of identical moments, so permanence if distinguishable at all requires another permanence of which it is the succession.

§ 5. As in the case of time we noticed specially the form called simultaneity, so we have now occasion to observe again the corresponding form of extension, namely co-existence. In a sequence of things their order of appearance cannot be reversed without altering the sequence; in a co-existence the things remain as permanent and the mind can pass from one to the other at will without impairing the phenomenon; either of the co-existing things can become first and the co-existence still remain as before stated (Chap. XII. § 15). I do not think co-existence can be resolved into sequence, for the essential idea of co-existence is statical whereas that of sequence is dynamical; co-existence is permanence, sequence is transition. Co-existence is a primordial experience arising from the capacity of the bodily system to receive two sensations simultaneously. Our earliest experiences are of co-existences. Though we may come to know co-existences through sequences, attending first to one thing and then to another, yet we know them only as consecutive until they appear co-existently; and no degree of rapidity of succession can give anything but succession till a new experience arises which is not succession, but permanence of two things together. The central notion of co-existence is the permanence of two things; the gist of sequence is motion, and until the idea of motion is excluded we do not get co-existence.

§ 6. From a very early period in the history of science and philosophy *time* has been considered as appertaining to both material and mental phenomena. At the risk of a charge of presumption in setting my own opinion against that of so many erudite and careful scholars of past generations and centuries, I must express my profound conviction of the irrelevance of time relations to material phenomena *inter sese*. The mistake in my judgment

has arisen from not apprehending the distinction between motion and time succession and between duration in time and space extension. Non-Ego phenomena and Ego phenomena run parallel and have close correspondences, but at the same time in those very correspondences exclude each other. Now extension we have separated into its two modes, the one implying permanence and the other motion. Motion is admittedly a phenomenon of material things; the sensations which give the experience on their Non-Ego side reveal or indicate motion; but the experience on its subjective side is that of succession in time—analogous to sequences of material things but excluding and being excluded by those very sequences. There is no material motion in a state of consciousness but an experience of successions which are representations of material sequences and which we are obliged to characterise in terms derived from material phenomena (as is the case indeed with most mental phenomena), but which exclude the material and oppose themselves to it. Taking the sensational experience together all there is of it on the objective or Non-Ego side is motion or sequences; all there is on the subjective or Ego side is succession in time. We gain nothing but confusion in attributing to the experience motion on the Ego side or time on the Non-Ego side. The same remarks hold good when we come to regard the duration element of time. The permanent or statical persistence constituent of extension applies clearly and indisputably to material things or at least to sensations on their Non-Ego side. On the other side duration is a representation of this persistence or permanence; the representation is not that permanence, it is another thing excluding the former. Upon the Non-Ego side the sensation is of something permanent or statically persisting; on the Ego side it is of something enduring or perduring: but these two things mutually exclude each other as the Ego and the Non-Ego are mutually exclusive. If the substances are mutually exclusive the respective attributes are so as well. Extension in its two modes belongs solely to the Non-Ego; time in its two modes belongs solely to the Ego. Space is purely of the external world; time of the internal. No attempted resolution of space-relations into time-relations or the converse ever has been successful or can be successful; the two sets are distinct, exclusive, parallel and correlative. This confounding of extension and time is perhaps the most signal instance of the misleading effects coming from the necessity of applying to mental phenomena terms taken from

the experiences of a Non-Ego world. Philosophers have seen that sequence and succession, motion, extension and duration all refer to one experience, but have not been able to see that this experience has two mutually exclusive sides, nor to assign the terms to the sides where they respectively belong in order correctly to indicate the relations of these two sides to each other.

PRESENTATIVITY.

§ 7. One attribute of external things which is postulated at the very outset of our knowledge of the Non-Ego we must not lose sight of nor longer delay bringing forward to notice in this connection. Knowledge of things outside of consciousness depends on an ability of those things to affect consciousness. We cannot have a sensation coming from the Non-Ego, without necessarily implying an ability in that Non-Ego to create a sensation. And if our knowledge of the external is derived from sensations the capability of producing sensations must belong to the external. Further it must be considered that our knowledge of things in relation to each other is acquired only through relations of those things separately to the perceiving subject. We think of them as they would affect our own bodily organisms. When we see a stone strike a house we think of the stone having action similar to what it would have on our muscles. In thinking of a distant and absent object we endow it with those characteristics which would appear to us if we saw, heard, tasted, or touched that object; and all its relations to other objects partake of those characteristics. We cannot think of material things except as they appear in some manner to our senses. This ability then of things to manifest or present themselves to our consciousness in different modes I have termed *Presentativity*.

§ 8. That all the other elements of material things which we have discovered thus far postulate presentativity needs no argument and little exposition. Relativity and consistency in objects are unknown to us and could not be known to us except those objects *make* themselves known to us, affect us, present themselves to our consciousness. The same may be said of extension both in the first instance and mediately through the other two. Nor is it easy to analyse presentativity into anything else. It certainly is not consistency, for consistency is a relation of a thing to itself or its own components, not to another thing; so also is perma-

nence. Sequence is a relation of one external thing to another thing external and not to the perceiving subject. In one sense the attribute before us is comprehended under relativity, for it expresses relations of the Non-Ego to the Ego: but the term relativity as we have employed it means discriminative relations of bodies to each other not to states of consciousness. We are developing now a relation of related bodies to the subject which knows bodies from a standpoint outside of bodies. The relations then of bodies to each other we express by the term relativity and of bodies to the perceiving subject Ego by the term *Presentativity*. In this sense the latter cannot be resolved into relativity. Unless we make this restriction we shall have to specialise two kinds of relativity, one the relativity of bodies to each other and a second the relativity of bodies to the Ego; and even then we should need some name to express the power of bodies in their relations to the Ego of affecting consciousness. This difficulty together with much general confusion is obviated by assigning presentativity as an independent element.

§ 9. We can bring up to this point also the parallel with Ego phenomena. Presentativity is correlative with consciousness of representation. The latter is the power of the mind to present objects to itself; the former the power of matter to present objects to mind. Representation postulates a presentation. The one power works from without in and upon, the other from within outward. What is presented by the Non-Ego may be represented by the Ego. Both are unanalysable experiences, but one we are compelled to attribute to the Non-Ego, and the other to the Ego, though the two are complementary. Here is the point of union and of division between the Ego and the Non-Ego.

FORCE.

§ 10. There remains one more element to be detected in the general analysis of externalities. The four thus far brought out require a fifth, and that is associated with the resistance qualities of body which in the last chapter we found so fundamental. *Force* is also a basic element of Non-Ego phenomena. And force is implied by the other four. Consistency postulates force to hold things together; relativity postulates force to repel and separate things; permanence postulates force to hold itself still; sequence postulates force to move; while presentativity we have

already defined as the *ability*, the power, the *force* to affect consciousness. Force can be analysed into none of these. On the other hand the notion of force needs for itself these other four. A force to be a force must be a consistent force; it is not a force distinguishable unless it stands related to some other body; it is no force unless it is permanent and it is not distinguishable as a force unless it follows some other body; nor can we know it as a force unless it present itself in some manner to our consciousness.

§ 11. In the preceding chapter the course of exposition elicited (§ 13) as implied in the primitive experience of resistance an *impinging* and a *resisting force* (*vis activa* or *vis motrix* and *vis passiva* or *vis inertiæ*). This experience makes plain two modes of force, *Active Force* and *Passive Force*. Material things act upon each other and are acted upon. Every action has its reaction. The analysis of the notion of resistance which we have heretofore made sufficiently establishes and illustrates these two sides of force.

§ 12. Once more referring to Ego phenomena we behold another correspondence. Consciousness of power is antithetical and yet exactly correlative to force. Power has its modes of activity and passivity, and so has force: but Non-Ego force is not Ego force. The two streams of phenomena run parallel but they keep perfectly distinct, and nowhere within human science does there appear an ability to merge the two or reduce one to the other.

CHAPTER XIV.

THE GENERAL SYNTHESIS OF EXTERNAL THINGS AND FURTHER ANALYSIS.

§ 1. THAT general synthesis of external things by which in Chapter XII. we arrived at the notion of matter (§ 11) demands some further consideration in its results. The name *matter* we give to the totality of external things and it is applied both to the phenomenon and the noumenon separately, and to both together. The appearance is sometimes called matter: oftener the word means the substance underlying the appearance; and sometimes the two together. I see no other way but to regard matter as a

totality of things; and a thing implies both a phenomenon and a noumenon. *Matter* is not an abstract name but concrete and refers to the concrete assemblage of Non-Ego things, whose common attributes are expressed by such abstracts as Force, Relativity, Consistency, and the like. Yet we also need to use *matter* as the name of an attribute of a something still more ultimate which we term Non-Ego in opposition to Ego. Non-Ego is the name of the substance objectified; *matter* is the name of the substance plus the phenomenal manifestation. We are also in the habit of speaking of matter as a quality. Bodies we say have *body* as their common attribute and *matter* we employ as the equivalent of *body*, it not being employed in the plural with the same meaning as the plural of body. Bodies we speak of as having materiality, or as composed or made of matter, the meaning being that they are a part of matter and agree with other bodies in being parts of one whole styled *matter*. The most general attribute of matter is externality or Non-Egoness which brings us around again to questions of the mutual connections of matter and Non-Ego. On the whole it seems most clear to use the former term in a sense analogous to that in which we use *mind*. There is an Ego and Non-Ego; these are the ultimate generalisations. The Ego has states of consciousness; the Non-Ego has belonging to it bodies. Mind is the sum total of all states of consciousness regarded as inhering in the Ego; matter is the sum total of all bodies regarded as inhering in the Non-Ego. A state of consciousness is of mind, mental, a part of mind; a body is of matter, material, a part of matter.

§ 2. The unit of matter is a body, or rather its units are bodies —material things. Now bodies, as we have seen, are of two kinds, forces which we are compelled to think as in spaces and spaces which by the constitution of our minds we are in like manner obliged to think as material and as circumscribed by and containing forces. As a fact forces and spaces do not occur separately. If then we wish to find a proper ultimate unit of external things we cannot accomplish our purpose by regarding it as a force alone or a space alone but some combination of the two. However much we may divide and subdivide matter it is not possible to get below the primitive experience of resistance, and that experience, as we have also noted, is one of at least two forces active and passive in a space. There is an impinging and a resisting and a separation between the two—room for both the impact and the resistance.

Therefore the ultimate atoms of matter must be conceived to be compound or three-sided—an impinging force and a resisting force and a space separating and circumscribing the two, the circumscribing space being defined by other atoms. In the Ego world we found the units to be states of consciousness, each having three aspects—volition or activity, feeling or passivity, and cognition or the relation between the others. Quite remarkably in examining the constitution of matter we come upon another correspondence of the external and the internal. The units of externalities are atomic bodies which are also three-sided, on the one side an active force, on the other a passive force, and on a third as uniting and yet separating the others a space within which the two forces stand and move.

§ 3. This analysis of the ultimate atomic composition of matter exposes the infinite divisibility of matter or bodies. For if every atom of matter has these three component parts the idea of further divisibility is always suggested with each atom. The compound whole is susceptible, it must always seem, of resolution into its three component parts. But upon separating these three we find that we have after all only three new bodies each of which has the same three-sided atomic constitution. Take each force separately and we discover that still we cannot but think it as composed of two other forces reciprocally active and passive in a space. In like manner take the space and behold we have it before our mind only in the habiliments of a force. Thus the truth dawns upon us that the mind is not able to conceive of an ultimate division of matter which is not still susceptible of further division, each subdivision repeating the three aspects of the portion above it.

§ 4. The infinite extension and motion of matter is in like manner postulated by the experience which our minds have of external things. For, as just shown, the limitation of the circumscribing space of an atom is only by another force. Such a limitation must somewhere occur, else there is no distinguishable atom or portion of matter. When it does occur we have at each point of limitation another body which has the same atomic constitution, and is itself made up of forces in another space, which in its turn must be conceived as cut off or limited by some other force or collocation of forces. This process goes on endlessly to our thought. The moment we try to conceive of an infinite that instant we make it a finite cut off from an unlimited still stretching on beyond. We postulate an infinite extension of

matter though that infinity is itself comprehensible or conceivable only by becoming a finite.

§ 5. Alongside of these attributes of infinite divisibility and infinite extension we perceive also the indestructibility of matter. However much we may divide there still remain atoms of matter to be divided; and whatever is cut away constitutes other atoms. In other language the relations of the parts of matter are changed but no part is extinguished. The atoms grow smaller but at the same time more numerous; what is lost in bulk is made up in number. The quantity of matter is only relatively changed. Divide as we may, compress to the greatest extent possible, still no material thing passes into nothingness. The mind refuses to think that any portion of matter is annihilated; for if it could, then it would be possible to sustain in thought a relation of something with nothing, which is an impossibility. We have then as the universe of matter in its ultimate constitution an infinitely extended aggregate of infinitely divisible but indestructible atoms each having a threefold aspect of active and passive force in a space.

§ 6. As a corollary from the foregoing we remark further the indestructibility of these several constituent aspects of material bodies when considered apart. No space is destructible; no active force is destroyed; no passive force is destroyed. For when we separate the atom into its three constituents these three, as has been exhibited, become three separate things each having the same atomic constitution as the original body, and preserving its integrity; none of the space is lost and none of the force is annihilated. If any one of the parts of an atom of body were destructible it would cease to be true that matter is indestructible. The indestructibility of matter, of space and of force at rest and force in motion, constitutes one and the same truth, a necessity of things to our thought. Space remains; force at rest remains force at rest, moving force remains force in motion.

§ 7. The various attributes belonging to matter as a whole have been classified as Primary or Statical; Secundo-primary or Statico-dynamical; and Secondary or Dynamical. The first class contains those attributes which have reference to matter as occupying space—qualities developed, as Sir William Hamilton puts it, 'out of the simple datum of substance occupying space.' He gives eight proximate attributes. '1. Extension; 2. Divisi-

bility; 3. Size; 4. Density or Rarity; 5. Figure; 6. Incompressibility absolute; 7. Mobility; 8. Situation.'[1] These are condensed by Mr. Spencer into Bulk, Figure, and Position.[2] The Secundo-primary qualities according to Sir W. Hamilton comprise Co-attraction, Repulsion and Inertia. The first of these includes Gravity or Weight, embracing Heavy and Light; and also Cohesion including the Hard and Soft; the Firm and Fluid; the Viscid and Friable; the Tough and Brittle; the Rigid and Flexible; the Finite and Infinite; the Ductile and Inductile; the Retractile and Irretractile; the Rough and Smooth; the Slippery and Tenacious. Repulsion is divided into the relatively Compressible and Incompressible; the Resilient and Irresilient. Inertia (combined with Bulk and Cohesion) comprises the relatively Movable and Immovable. The same philosopher makes Secondary qualities include 'those phenomenal affections determined in our sentient organism by the agency of external bodies.' 'Such are the proper sensibles, the idiopathic affections of our several organs of sense, as Colour, Sound, Flavour, Savour and Tactual Sensation; such are the feelings from Heat, Electricity, Galvanism, etc.; nor need it be added such are the muscular and cutaneous sensations which accompany the perception of the Secundo-primary qualities. Such though less directly the result of foreign causes are Titillation, Sneezing, Horripilation, Shuddering,'[3] etc. Mr. Spencer thus expresses the relations between these three classes of bodies.[4] 'The relation established between object and subject in the act of perception is threefold. It assumes three distinct aspects according as there is some kind of activity on the part of the object, on the part of the subject or on the part of both. If, while the subject is passive, the object is working an effect upon it—as by radiating heat, giving off odour, or propagating sound; there results in the subject a perception of what is usually termed a secondary property of body, but what may be better termed a dynamical property. If the subject is directly acting upon the object by grasping, thrusting, pulling, or any other mechanical process while the object is reacting, as it must, to an equivalent extent; the subject perceives those variously-modified kinds of resistance which have been

[1] *Philosophy of Perception.*
[2] *Principles of Psychology*, Part VI. Chap. XIII.
[3] *Philosophy of Perception.*
[4] *Principles of Psychology*, Part VI. Chap. XI.

classed as the secundo-primary properties, but which I prefer to class as statico-dynamical. And if the subject alone is active—if that which occupies consciousness is not any action or reaction of the object, but something discerned through its actions or reactions—as size, form, or position; then the property perceived is of the kind commonly known as primary but here named statical.'

§ 8. This classification is often useful, but is somewhat dangerous in fostering the idea that our primary experience is of *body* instead of *bodies*, and also in deluding people by an appearance of finality leading to the belief that it expresses the ultimate qualities of bodies and only the ultimate attributes. That this is not the case is evident to those who have followed the course of this exposition. But in the light of our analysis the true meaning and relations of all these divisions plainly appear; and Sir William Hamilton's classification of qualities as applicable to matter taken as a totality when studied in this light is serviceable both to the psychologist and the searcher after truth as it is in external phenomena. All these attributes are modes of relativity, consistency, extension, presentativity and force.

§ 9. There are a few other names used in connection with material things whose meaning it is desirable to notice. And first let us observe the distinction between Molecule and Atom. *Molecule* expresses the smallest portion of matter which can be reached by our means of dividing and still be manifested to the senses. When molecules are of simple homogeneous elements as of gold or silver, they are called *integrant*; when they are of compound or heterogeneous elements as salts and acids, they are called *constituent*. *Particle* is sometimes used as synonymous with molecule. By *atom* is indicated our idea of an ultimate portion of matter beyond which division cannot go. An atom is conceived, not perceived. Monad is sometimes used (but unfortunately) in the sense of atom.

By *reality* we mean *a real thing*. Thing we have already defined (Chap. XII. § 3) as a distinguishable persistence in consciousness with a subjacent ground of inherence. The word *real* in such a connection means the same as *material*, and is contradistinguished from *ideal*, an ideal thing being a state of consciousness. By *quality*, we mean the distinguishing peculiarity of a body which separates it from other bodies. By *quantity*, we express the relations of bodies as greater and less and equal.

Quantity is *extensive* or relative to the amount of space occupied statically, *protensive* or relative to the amount of space occupied dynamically, and *intensive* or relative to the amount of force as resisting or impinging upon other force. *Magnitude* gives the idea of *Continuous Quantity*; *Multitude*, of *Discrete Quantity*.

CHAPTER XV.

THE SYNTHESIS OF INTERNAL AND EXTERNAL THINGS.

§ 1. A FURTHER synthesis than any we have made yet is made by the mind in studying objects of knowledge, and this is a synthesis of the two streams of things which are separated into Non-Ego and Ego. It is the office of philosophy to make the highest unifications of knowledge and to deal with its higher unities. Whatever concerns the common features, if there are any, of mind and matter and whatever considerations there are tending to show no community between the two lie wholly within the province of philosophy and are not properly the subject of a psychological science. But there is a synthesis of Ego phenomena and Non-Ego phenomena which is so intimately connected with both somatology and psychology, that neither of these sciences is complete without some reference to it. This synthesis is expressed by the word *Nature*.

§ 2. *Matter* expresses the totality of external things but with their statical side uppermost. *Nature*, on the contrary, brings up most prominently the dynamical side. Nature is the sum total of that which is produced, and so far as something produced produces something else the term also includes that which produces or causes to be produced. The leading notion involved is that of sequences. But though the dynamical is the salient notion in the idea *nature*, it does not exclude the statical. Nature is both *causata* and *formata*, and embraces the statical aspects of things together with, but as secondary to, the dynamical. The true distinction between matter and nature is the one I have already stated and the further fact that nature also comprehends aggregates of mental things. Nature is the entire object world, not merely the world of material objects. Nature is thus in a degree the synthesis of the external and the internal.

§ 3. In several places in this work, particularly in Chapter III. in dealing with the fundamental antithesis between the Ego and the Non-Ego, in Chapter VI. on the Data of Psychology, Chapter VII. on the Method of Psychology, and again in Chapter XI. which treats of the Postulates of Psychology, we have noticed a sort of location of Ego phenomena in and among Non-Ego phenomena, as it were making Ego things Non-Ego by the necessity of objectifying them in order to know them. Non-Ego phenomena we know by looking outward; Ego phenomena we know both by looking outward and also introspectively. The existence of other minds we infer by sundry observations, and these minds we class as Non-Ego and yet also as being distinguished from Non-Ego and being of the nature of Ego—what William Kingdon Clifford called *ejects*. Studying our own states of consciousness, in the process of objectifying we place ourselves really among these other minds whose existence we infer as outside of ourselves and in the midst of matter, yet all the while retaining and postulating a subject-Ego as behind consciousness, conditional for consciousness and yet not susceptible of definite cognition. Now a synthesis of everything not subject is expressed by the term *Nature*.

§ 4. Nature therefore includes—1. Material objects and their relations; 2. Other minds and their relations as inferred to exist; and 3. The object-Ego with all its states and their relations, unities and diversities, times, and representations. The first of these classes comprises what is called *Material Nature* or *Nature as Matter*: the other two, *Mental Nature* or *Nature as Mind*. Organised knowledge of the first constitutes the Science of Somatology; organised knowledge of the latter, the science of Psychology; from both of these general sciences, special sciences are differentiated (see Introduction, Chap. V.).

§ 5. The general analysis of material objects developed related, consistent, presentative forces and spaces in co-existences and sequences. The general synthesis of these objects in matter and the analysis of matter developed as the units of matter atomic bodies each containing an active and passive force in and circumscribed by a space. These have a common synthesis in matter and deeper in a Non-Ego substance. The general analysis of mental objects exhibited differing, agreeing, represented states of consciousness simultaneous and successive and manifesting active and passive power. The general synthesis of these Ego objects in Mind and the analysis of mind elicit as units of

mental phenomena these states of consciousness each of which has a threefold aspect of feeling or passivity, volition or activity, and cognition or the relations between the two and between those of each set. All of these have a common synthesis in mind and beyond that have a ground in an Ego which *has* mind. Now these two sets of things, mental and material, when brought together in a Nature of things have certain common relations. These are :—

1. Substance and Attribute.
2. Cause and Effect.
3. Reciprocal Interaction.

§ 6. Both material and mental phenomena postulate, as we have repeatedly seen, a *substance*, in which as attributes or qualities these phenomena inhere. This substance we have termed in the respective instances the Non-Ego and the Ego. The relation of substance and attribute on the Ego side is derived from the experience of a duration in which successions occur, the chief idea being that of continuity or endurance, an enduring *source* out of which spring *events*. The relation on the Non-Ego side is derived from the experience of spaces as permanent and immovable but as affording room for motion. In like manner here the emphasis is laid upon the permanency. The substance *remains* and its attributes *stick in* it; it is the ground for those attributes.

§ 7. For the next relation let us take the Non-Ego class first, though there is nothing to hinder our beginning with the other if it enters our thought so to do. The experience of forces as dynamic, thus implying sequences or motion, is at the bottom of our notion of cause and effect in the material world. One force impinging upon another and inducing an irreversible sequence of distinguishable things gives us in the antecedents a cause and in the consequents an effect. 'The conception of a cause is that of a space-filling force as one substance obtruding itself upon the place of another space-filling force as substance and by the modifications induced securing . . . changes in the latter which manifest themselves to the same in altered phenomena.'[1] In Ego phenomena the experiences of successions in time of manifested active power, in precisely similar manner, ascribe to the antecedents the notion of cause and to the consequents the notion of effect. In both

[1] Hickok's *Rational Psychology* (1861), p. 269.

instances the idea is not merely of sequence and succession but on the one hand of impinging force and sequence; while on the other it is active power and succession. Simple succession and sequence will never give us cause and effect: the notions of power and force must be superadded.

§ 8. Forces as antagonised producing a static condition of co-existence account for the relation of Reciprocal Interaction or Action and Reaction. Force impinges upon a resisting force; the two hold each other in check and appear as two co-existing things. 'When the apprehension of one phenomenon has passed and another has been apprehended, and then the apprehension of the first may be again repeated at pleasure, it manifests that the occasion for such phenomenon remains and the order of apprehension each way is the index that the connection is that of reciprocal influence, not of cause and effect. When, therefore, all co-existing things reciprocally influence each other, such influence gives occasion for the same phenomena in each so long as the modifications of any one does not make its changes in all. Thus when the presence of the sun acts and re-acts in the modifications of its light upon all, my perception in the organ of vision may be from one co-existing substance to another in the phenonena thus occasioned and in a reversed order of apprehension arbitrarily, and I determine them as contemporaneous; but when the sun is withdrawn and such action and reaction ceases and such modifications have passed away, and I can no longer pass in my apprehension from one thing to another, I can no longer determine their contemporaneousness, but only the successions that have passed since they all disappeared.'[1] With Ego phenomena a similar course of exposition with the notion of simultaneity of power manifestations results in the relation now before us. This is too obvious to require any further consideration.

§ 9. Though mind and matter have thus a correspondency of relation as regards their respective constituents, let us avoid the error of supposing that we have united the two in a common substance. Make what synthesis we can and are pleased to make and

[1] Hickok's *Rational Psychology*, p. 279. I object to the use of the word *contemporaneous* and its noun. I think it misleading; the author means *co-existent* in space. I am glad to be able to quote Dr. Hickok with approbation, since at a later stage I am obliged to deal somewhat severely with the system of philosophy which he represents. One can always learn something from the study of every earnest philosophical worker, however much he may be compelled to criticise, qualify, and reject.

call the result nature, we nevertheless cannot get rid of the supposition of the subject Mind which excludes itself from nature and nature from it, which itself makes the synthesis we call nature; which even includes itself, as objectified, in nature, though postulating itself for nature and which distinguishes in nature these two streams of phenomena inherent in two mutually exclusive unknown and unknowable substances. No consciousness and no synthesis establishes between mind and matter, Ego and Non-Ego, the relation of substance and attribute. The utmost relationship is that of co-existences mutually interacting; and that interaction is of a different character from the interactions of the things of the respective classes among themselves. A subject Ego is still ever postulated beyond nature and in similar manner a subject Non-Ego (Chap. XII. § 11).

§ 10. A reasonable amount of reflection will elucidate more fully these last propositions. The Ego objectifies itself and the whole series of states of consciousness thus objectified it associates and generalises under the notion mind. This object mind, the mirroring or symbol of the subject mind is described and to it are ascribed substance and cause, *as themselves attributes.* That is, in examining a subject mind we objectify it and it loses its character as subject, but there rises behind it still another subject mind, so to speak, which in like manner eludes our pursuit (Chap. XI. § 1). Now this objectified mind with its attributes of substance and attribute, cause and effect, and reciprocal interactions, is included in nature, but a subject mind outside of nature is all the while postulated. In like manner material phenomena are gathered together into one whole which we call matter, embracing relations of substance and attribute, cause and effect, action and reaction. But all these with other relations of material things are themselves thought as attributes of a subject Non-Ego unknown and unknowable, of which an object Non-Ego as substance and attribute, cause and effect, action and reaction is the symbol. Thus we are brought around again to the first datum of science and philosophy—the mutual exclusion of a postulated Ego and Non-Ego. And we further learn that Mind is an object, whose substance and attributes are themselves attributes of an unknowable subject Ego beyond, of which the object mind is but a symbol; and on the other hand Matter is an object which is both substance and attribute, cause and effect, action and reaction, which however are themselves all attributes of a subject Non-Ego of

which matter with its internal relations is itself but the symbol. And finally we ascertain that nature is a synthetical whole of object Ego and object Non-Ego, matter and object-mind, but still leaves out both subjects.

§ 11. Clearly then is it apparent that nature though a totality of things material and mental, is by virtue of its being a totality itself a limited thing. Make the synthesis wide enough to include every thing, and the moment you gather all things into a totality you imply a circumambient or circumstantial something which is not that totality but from which it is cut off or out of which it is carved. Beyond nature, therefore, no matter how far you extend it, is postulated an extra-natural or super-natural. What may be said of this supernatural does not concern us here. All that is needed is to remind ourselves that though we make a synthesis of the external and the internal in a Nature of things, yet this nature is meaningless and cannot even be thought except as postulating a something over and beyond nature, unlimited, absolute, unconditioned, which is not nature but conditional for nature.

§ 12. We need to remark further but two corollaries from what has gone before. Since nature is a totality of things and since the mind cannot conceive of an attribute without a substance, an event without a source, the indestructibility of everything in material nature is postulated. The quantity of matter in the universe, therefore, is not lessened and no end of matter whether as space or force is conceivable. In like sort since we cannot conceive the passing of a thing into nothing, neither can we conceive the coming forth of a thing from nothing. Within nature, therefore, it is also true that there is no creation of matter and no beginning of matter. Hence to our thought material nature is without increase or diminution in quantity, without beginning and without end.

CHAPTER XVI.

LAWS OF NATURE AND THE POSTULATES OF SOMATOLOGY.

§ 1. A SCIENCE of material things is the expression of our generalised knowledge of such things. To such a science there is necessary therefore a combination of the relations of the things

known to each other and also those subjective relations which constitute the knowing. Science has already been explained (Chap. I.) to differ from ordinary knowledge in the especial regard of being generalised and thus unified knowledge, verification being supposed also. A science of somatology thus consists of general affirmations (and denials) respecting material things. But of what does generalisation consist? It consists of the noting and uniting common properties, the observing, therefore, likenesses and differences, uniformities and diversities in the objects generalised. The expressions of these uniformities and diversities of objects in propositions are Laws of Nature and when covering material objects only Laws of Material Nature.

§ 2. It has been heretofore remarked that knowledge assumes some things. There are some experiences which are unanalysable and ultimate giving rise when generalised to ultimate notions. Such experiences, and based on experiences such notions also, when expressed may be expressed in isolation, in which case we have general names; or in connection, to the end of higher generalisation in the form of predications in propositions. Generalisation carries with it predication and complete experience is not possible without propositions (Chap. IV.). The existence then of ultimate experiences necessitates ultimate general notions (ultimate save that they always may be analysed into their original particulars); and these ultimate general notions imply and necessitate for the complete scientific expression of experience ultimate propositions or principles, which we call Postulates. The most ultimate and most universal laws of nature are consequently Postulates.

§ 3. We are at present concerned only with the laws and postulates of material nature. The postulates of psychology we have already found (Chap. XI.) and we have also deemed it necessary at an early stage in our study to ascertain what are the general postulates of science (Chap. III.). We shall unavoidably have suggested to our minds some of the relations of these various sets of postulates to each other, but it is no part of a science of psychology to pursue the examination of those relations any farther than to show in a general way the unity of all knowledge. As has been repeatedly observed in these pages the definite scientific unification of all knowledge in its highest synthesis is the province of philosophy. We shall, therefore, now seek to express those most general truths respecting material things which fairly may be termed postulates of somatology and in a subordinate

way indicate some of their relations to the postulates of psychology and the postulates of science in general.

§ 4. At the outset we shall have presented very obviously as a postulate of material nature the law of the antithesis of the Ego and the Non-Ego, which we heretofore found to constitute the first postulate of science. This can be expressed as we expressed it in Chap. III., or with special reference to somatology in two divisions in similar manner as expressed with reference to psychology in Chap. XI. Following the latter course we have:

THE LAW OF THE SUBJECT NON-EGO.

§ 5. *All knowledge implies and postulates a subject Non-Ego as antithetical to and exclusive of a subject Ego and which furnishes a ground for the common synthesis of all things affecting consciousness which are distinguished by it from things of and belonging to the Ego, and which in its substance is unknown and unknowable.*

Complementary to this is

THE LAW OF THE SUBJECT EGO.

All knowledge and thus all knowledge of material things implies and postulates a subject Ego, whose substance is unknown and unknowable, to which states of consciousness are referred as attributes but which in the process of reference becomes objectified and becomes itself an attribute of a subject Ego which lies still beyond and which ever eludes cognition though ever postulated for cognition.

These two postulates or this double postulate, slightly varied in expression from Chap. XI., are postulates of relativity, expressing the law of universal relativity, by which it appears that everything in nature is related to and discriminated from some other thing. They both indicate this truth, and further indicate the origin of the truth, namely in a primitive experience of consciousness which lies at the root of all knowledge whatsoever.

THE LAW OF CONSISTENCY.

§ 6. A universal relativity of things implies a consistency of things. The law of consistency, therefore, is a law of material nature as well as a law of nature. Unless bodies consist we can

have no experience of them. Hence as a third postulate of somatology we have this law in its two expressions :—

Whatever is, is :

A thing cannot at the same time both be and not be.

THE UNIFORMITY OF NATURE.

§ 7. That general postulate of science styled the uniformity of nature is obviously and pre-eminently a postulate of somatology. Its statement however requires to be varied somewhat from the statement heretofore given for science in general.

Whatever things have come into experience in the past will recur and be repeated in experience, if the circumstances of the former experience recur.

As circumstances vary so experiences vary as respects sameness and difference.

This is a law of extension in its two modes of permanence and motion. It expresses the permanence of things in the material world and also the sequence of events. Its prominent aspect is dynamical rather than statical, though by no means excluding the latter. It is a law of change and permanence in the midst of change.

§ 8. We have thus made use of three out of the four fundamental postulates of science. Since knowledge scientifically coordinated is made up of cognitions constituting its subject matter, as postulates of the science of knowledge they are postulates of cognitions. As postulates of the science of nature, they are postulates of object things ; and as postulates of somatology they are postulates of material things and their relations. The fourth postulate of science (see Chap. III.) is not relevant to somatology, except in a sense which really makes it a corollary of the uniformity of nature and the other postulates. Nature embraces the whole object world but implies all the while, as has been seen (Chap. XV. § 9), a subject Ego, as it were overlooking and cognising nature. The law of identification is purely a law of knowing, a postulate of *science as science* ; but when we transfer it to the object world wholly and use it as a law of the relations of objects merely, it becomes no longer a law of active identification of objects, but a law of the recurrence of same and different things, a law of permanence and change, depending for its meaning and value on consistency, relativity, and the uniformity of nature. It amounts to an expression that things same and different occur and recur

and that those which are the same are the same and those which are different are different.

THE LAW OF PRESENTATIVITY.

§ 9. The presentativity of material objects gives us another postulate and one special to somatology:

All statements respecting material things postulate in those things a capacity to manifest and present themselves to consciousness in different modes.

This is correlative to the law of reflection in psychological science.

THE LAW OF FORCE.

§ 10. *A nature of material things postulates pairs of persistent forces reciprocally acting and reacting, co-attractive and repulsive, co-existent and consecutive, equal and unequal.*

This law is an expression of the truths respecting force which our prior analysis has elicited.

Correlative to this law and having like warrant is

THE LAW OF SPACE.

§ 11. *A nature of material things postulates spaces which contain forces and which are themselves immobile, non-resisting, co-existent, exhaustively confluent, and exhaustively divisible.*

THE MOLAR COMPOSITION OF MATERIAL NATURE.

§ 12. Following the synthesis of forces and spaces in matter and then pursuing the analysis of matter which we have made in recent chapters, the following two laws are convenient expressions in propositional form of the ultimate notions there reached. The first may well be styled as in the caption of this section:—

A nature of material things postulates something related to some other thing by difference, something consistent or agreeing with itself, something permanent, something succeeding something, something presentative to consciousness, something acting upon something and something receiving and resisting action.

The other is that of

THE ATOMIC COMPOSITION OF MATERIAL NATURE.

§ 13. *Material nature is composed of an aggregation of atoms, each of which postulates two forces reciprocally acting and*

reacting, co-attractive and repulsive, co-existent and consecutive, in a space which contains them and which is itself immobile and non-resisting.

§ 14. Taking nature as a totality of things we can frame two general postulates, the one of the internal relativity of nature and the other of its external relativity, the former being a relation of a whole to its parts, the latter a relation of one whole to something outside of that whole. These laws only state in propositional form truths which we have already arrived at in the preceding analyses and syntheses.

THE INTERNAL RELATIVITY OF NATURE.

A nature of things postulates co-existences and sequences existing under the relations of substance and attribute, cause and effect, action and reaction.

THE EXTERNAL RELATIVITY OF NATURE.

A nature of things, as a totality postulates an extra-natural or super-natural.

§ 15. Not all of the above postulates are ultimate in the sense of not being resolvable into other truths. Though all of them express ultimate truths, the last four are only the equivalents of the others or some of them. The postulate of the molar composition of material nature is a summing up of those before it. The law of atomic composition is but another expression of the laws of force and space, while the two in the last preceding section are deducible from the primitive relations of spaces and forces. These last four I have advanced to correspond with the notions found in the aggregates of matter and nature which are made by synthesis of forces and spaces for the one and forces and spaces together with mental objects for the other. Taking out these four, therefore, we have remaining seven laws claiming to be underived and unanalysable laws of material nature. Now the test of a postulate is the inability to explain it without implying that which one sets out to explain. And if each of the seven expressions above given be an ultimate principle we ought to find this to be the case with respect to it. Such a result has been already reached with respect to the fundamental antithesis of the Ego and the Non-Ego expressed in the first two (Chap. III.); and also with respect to the law of consistency and that of the uniformity of nature. We have

also seen that the law of presentativity is ultimate unless we place it under relativity (Chap XIII. § 7) and then we should be obliged to indicate two ultimate modes of relativity with the essential quality of presentativity attached to one of those modes, and not to the other, which amounts to the same thing as to assign a separate position to presentativity. Furthermore we have seen how all experience implies the doctrines of force and space as they have been above expressed. But this is not all. It is plainly apparent that each one of these seven principles implies all the rest. In Chapter III. we observed this sort of connection between the postulate of Ego and Non-Ego relativity, that of consistency, and that of nature's uniformity. In like manner presentativity postulates consistency and relativity and distinctly a relativity between an Ego and a Non Ego; it also implies nature's uniformity because while there is presentation to consciousness there is persistence from moment to moment, that is it must be repeated or recur; that there is such a recurrence of the same experience postulates the stability of nature. So likewise this persistence implies a force acting on another force in space. Similarly the laws of force and space postulate consistency and relativity, the uniformity of nature, presentativity, and Ego and Non-Ego antithesis. Again, the first three principles postulate *things* and as applied to the material world material things in relations; but material things mean forces and spaces and an ability of those forces and spaces to affect consciousness. Thus appear the law of presentativity, the law of force and the law of space. And this completes the circle.

§ 16. To sum up: science teaches us seven ultimate postulates of somatology of which the pair at each end of the list might be united to form a double postulate, the first indicating a relativity of matter to mind and mind to matter and the last a relativity of two component elements of the idea of bodies to each other. All of them are explications of those ultimate notions which are expressed by the abstract names *relativity*, *consistency*, *extension*, *presentativity* and *force*, which come from generalisations of the concrete experiences of forces and spaces. That these are all the ultimate postulates or the most ultimate that will ever by any possibility be reached is of course not claimed; all that is maintained is that in the present state of somatological science they are on the whole the most satisfactory propositional expressions of the truth which is in material nature of which we have experience.

CHAPTER XVII.

SOME FURTHER GENERAL LAWS OF SOMATOLOGY

§ 1. THERE are some other general laws of material nature of high generality, but which are not ultimate or if they are ultimate are only partial expressions of underived and unanalysable truths, or compound expressions of two or more. They are truths whose proper synthesis with other truths has not been fully carried out or which have not been analysed to their fullest extent. They are either deductions from the postulates, compounds of them, or members of postulates separated from their connections. All of them have been of great importance in scientific investigation. To these we will address ourselves for a few pages.

THE PERMANENCE OF SPACE.

§ 2. *Space is permanent and immobile.*

This is a portion of the law of space given in the last chapter, the foundation for which is found in Chaps. XII. and XIII. It is conditional for the persistence of force, since we have no idea of force except in a permanent and immobile space.

THE PERSISTENCE OF FORCE

§ 3. *Force is persistent.*

The doctrine of the persistence of force is the most noteworthy generalisation of recent times. It is not too much to aver that at present material science is founded upon this law. The above formula is the shortest expression of the truth, but too short to bring out its full meaning. The law of force of Chapter XVI. (§ 10) is a better statement. For the persistence of force means not the persistence of one force but of two forces mutually interacting. It implies action and reaction; that every force has another force upon which it acts and in turn is itself the reaction of some other force. It postulates all that is expressed in our law of force—besides action and reaction, co-attraction and repulsion, co-existence and sequence, equality and inequality. Implicated with these are of course the notions of motion and rest, static and dynamic.

§ 4. The persistence of force is thus an ultimate truth: but

there are other truths equally ultimate and equally important, which have been unduly dwarfed by the prominence ascribed to the force doctrine. Without these other truths the persistence of force is itself meaningless. They all arise from the notion of space, which has been thrown aside by philosophers who have made the most of force as if the space were not itself a reality but merely a mental abstract of force experiences. This is true in a sense: but it is not merely an abstract of force experiences but also of space experiences. In other words the notion of space is just as fundamental and primitive in sensational experience as is the notion of force. The persistence of force postulates the permanence of space. The five chapters last preceding have contained the expositions of facts which show the correctness of this view. The reader is recommended to carefully re-peruse Chapter XII. at this point. If no error or omission has been there made, the truth of what is now stated is obvious and follows necessarily. If force implies *room* in which to move which *room* is not force; and if the mind cannot conceive of vacuity and this *room* for motions be not mind, then we have no alternative but to esteem it body and suppose a material substance which it has in common with force, its twin brother. And if forces may move and be at rest, that in which they move and are at rest or in equilibrio is permanent and immobile. If there be not such a permanent thing, then there can be no equilibrium of forces and no non-equilibrium of forces; there can be neither static nor dynamic, in a word no persistence of force, because there can be no force at all. The notion of force thus postulates space and the permanence of this space is conditional for the persistence of force, as the persistence of force is conditional for the permanence of space; since we should not know space at all were it not for force and the very conception of space is of a non-resistance for resistance to be manifested therein.

§ 5. It follows, likewise, that the persistence of relations between forces is not deducible from the persistence of forces but is another expression of a truth of equal rank with that of the persistence of force. For relations between forces must be themselves things to be thinkable. If we say that they are subjective or mental merely, we shall still be compelled to supply as belonging to the external world some bond of connection between forces. If again we claim that all these bonds or relations are purely subjective, then we shall be obliged to concede that the forces themselves are subjective. There is no more reason for ascribing

externality to forces than to the relations between forces. It may be urged that forces affect consciousness but the relations between forces do not: but the answer is that we do not know one force from another except by the apprehension of an objective reality which is different from either, a permanent which connects the two in sequence. If then the permanent connection is mental, that which appears in the permanent is mental also. The alternative suppositions are that forces and spaces are together and each of them primitive experiences, complementary to each other and both objective and material realities. Force is matter and space is matter. The relations of apprehension of forces by the subject are time relations having an actual material correlative in spaces which are material relations between forces. The transcendent principle of the relations between forces is hence not the persistence of force but the permanence of space, and though it is true that the persistence of relations among forces implies the persistence of force it is just as true that the persistence of force implies the persistence of relations between forces.

§ 6. That the uniformity of law can be resolved into the persistence of force and the persistence of relations between forces is undeniable if we add to these notions all their general implications, namely consistency, relativity, extension and presentativity and particularly the notion of extension. The uniformity of law is, as we have seen (Chap. XVI. § 7), a postulate of extension. Given persistent forces succeeding each other in a permanent space and the uniformity of law expresses that experience. For the persistence of force postulates that no force is lost. 'If in any two cases there is exact likeness not only between those most conspicuous antecedents which we distinguish as the causes, but also between those accompanying antecedents which we call the conditions, we cannot affirm that the effects will differ without affirming either that some force has come into existence or that some force has ceased to exist. If the co-operative forces in the one case are equal to those in the other, each to each, in distribution and amount; then it is impossible to conceive the product of their joint action in the one case as unlike that in the other, without conceiving one or more of the forces to have increased or diminished in quantity; and this is conceiving that force is not persistent.'[1] This truth can possibly be made a little clearer still. The force A impinging implies another force upon which it im-

[1] Spencer's *First Principles*, Part II. Chap. VII.

pinges; this other force must either be equal or less or greater than the force A. Suppose it to be equal, then we have a force A resisted by an equal force B. Two forces are hence in equilibrium and given only these there is a statical condition of two forces in a permanent. So long as this experience continues there is absolute uniformity, the circumstances of the forces remaining permanent; that is the space being permanent and there being no change of relation of the forces. Suppose now A to be greater than B and their relations indicated thus A C B. When A | C impinges on B, B neutralises A and the two form a statical force with a new force C as a sequent which in its turn must be regarded as acting upon some other force D either equal or unequal. Now if A C returns, either B the equal of A must follow as the reacting force with C as a consequent new dynamic force or some part of A C or B must disappear into nothing, which is impossible. Similarly if A is less than B; we shall then have only a relative change of the two forces with respect to each other thus A B | C; C will still be resultant. So that where there is a sameness of antecedents there is a sameness of consequents. The same truth is illustrated by co-existences as well, but there is scarcely need of multiplying illustrations. Given the persistence of force and the persistence of relations between forces, that is, as we have seen, the permanence of space, and given also motion or sequence, and the uniformity of nature appears. If now A | B C appears with B as a reaction, B and B neutralise each other B B and A | C appears as a consequent; if instead of A C or A B C recurring, A | D appears the unequal force A or D reacts and the consequent is either A or D, A A and D, or D | D and A. So that as circumstances vary so consequent experiences vary, which is the other side of the uniformity postulate. To conceive it otherwise is to deny persistence of force and the permanence of space. Uniformity of law postulates succession; succession postulates a permanent in which sequence takes place, and unless a given antecedent be followed by a given consequent something has come from nothing into being or gone out from being into nothing. It thus sufficiently appears that the uniformity of law depends upon the persistence of force to be sure, but not merely on that but on the permanence of space as well and also carries with it the notion of extension.

§ 7. Incidentally the last section referred to the truth before made evident and now to be specially noticed that for the per-

sistence of force is also postulated the consistency, relativity, and presentativity of things. The persistence of force is not thinkable without the notion of another persisting force; it is no more thinkable without the notion of the consistency of each force with itself, that is the identity of each force; no more is it conceivable without the notion of a power to affect consciousness. And we have just seen how the notion of extension as motion in a permanent is inextricably interwoven with the idea. From all these considerations I am compelled to regard the persistence of force as only one of at least six postulates of equal scientific rank; and as expressing in its ultimate reference only one side of an experience of which the permanence of space is the other.

THE INDESTRUCTIBILITY OF MATTER.

§ 8. *Matter is indestructible.*

Having postulated that space is permanent and force is persistent, the indestructibility of that which is their synthesis, ensues as a corollary. But the persistence of force alone could not give us this truth. Suppose force to persist but space to be removed; then the force also vanishes since we cannot conceive of force but in *room* or space; thus unless there be a permanence of space both matter passes into nothing and force itself ceases to persist. Moreover if our analysis of the atomic constitution of matter be correct, however fine we may make the division and subdivision we cannot destroy any matter, but each resultant of the division is an atom containing or exhibiting a permanent space and persistent forces. The indestructible atom is a microcosm exemplifying the mutual implications of spaces and forces. The indestructibility of matter, therefore, is indeed an ultimate truth but a compound of two ultimate truths with their implications.

THE CONSECUTIVENESS OF MOTION.

§ 9. *Motion is consecutive or persistent.*

This is the law of the continuity of motion, to which term however I object for reasons before advanced (Chap. XIII. § 6). We have again in this instance a corollary from the permanence of space and the persistence of force; for by motion we mean a moving force, that is a force changing position in a permanent. If then the permanent be truly permanent and the force be persistent the motion is not destroyed; the force may be resisted but

the increment of impinging force over and above the resisting force passes on and remains dynamic; the direction of the moving force is changed, but the moving force itself is never annihilated To assert that motion is not persistent is the same thing as to say that moving force is not persistent, which is to deny both the persistence of force and the permanence of space.

THE DIRECTION OF MOTION.

§ 10. *Motion follows the line of greatest traction or the line of least resistance or the resultant of the two.*

This law is another corollary from the two postulates of force and space. 'Suppose two weights suspended over a pulley or from the ends of an equal-armed lever; or better still—suppose two men pulling against each other. In such cases we say that the heavier weight will descend and that the stronger man will draw the weaker towards him. But now if we are asked how we know which is the heavier weight or the stronger man; we can only reply that it is the one producing motion in the direction of its pull. Our only evidence of excess of force is the movement it produces. But if of two opposing tractions we can know one as greater than the other only by the motion it generates in its own direction, then the assertion that motion occurs in the direction of greatest traction is a truism. When going a step further back we seek a warrant for the assumption that of the two conflicting forces that is the greater which produces motion in its own direction, we find no other than the consciousness that such part of the greater force as is unneutralised by the lesser must produce its effect—the consciousness that this residuary force cannot disappear, but must manifest itself in some equivalent change—the consciousness that force is persistent.' . . . 'It needs scarcely be added that if in place of tractions we take resistances, the argument equally holds; and that it holds also where both tractions and resistances are concerned. Thus the law that motion follows the line of greatest traction or the line of least resistance or the resultant of the two is a necessary deduction from that primordial truth which transcends proof.'[1]

THE RHYTHM OF MOTION.

§ 11. *All motion is rhythmical.*

Given an impinging and a resistant persisting force and the universal rhythm of motion is deducible. So far forth as there is resist-

[1] Spencer's *First Principles*, Part II. Chap. IX.

ance to a force its motion is thrown backward. Force meeting with resistance reverses its motion until it meets with new resistance when the direction is again changed. Impinging and resisting taking place consecutively thus imply an oscillation of motion ; and this is the idea we have of all force. Wherever there is matter there are attraction and repulsion, motion forward and back. The law of force then with its implications postulates the rhythm of motion.

THE INERTNESS OF REST.

§ 12. *A body at rest tends to remain at rest.*

This is the law of inertia on its statical side. If two forces are in equilibrium the persistence of force and the permanence of space require that they so remain unless some force be obtruded upon one of them or pulled away from one of them to destroy the equilibrium. In other words moving force must be added to the phenomenon : until this is done the state of rest remains. This law is only a definition—another expression of the persistence of forces in a permanent space.

THE LAW OF ACTION AND REACTION.

§ 13. *Action and reaction are equal and opposite.*

This is a statement of a truth implied in the notion of resistance to motion. So far forth as there is resistance the conception is of an equal amount of force opposed to an impinging force ; if the resistance is not perfect then the excess of impinging force continues moving having no reaction or resistance opposed to it. But the idea of two forces in equilibrium is of an equal action and reaction ; this is necessarily implied in the notion. And since resistance is a reversal of motion necessitating the belief that all motion is rhythmical ; it is equally a universal truth that the reaction is opposite to the action. That action and reaction are equal and opposite follows as a corollary from the laws of force and space.

THE LAW OF CAUSE AND EFFECT.

§ 14. *Every event that happens is definitely and uniformly connected with some antecedent event, or events, which happening it happens ; and which failing it fails.*

It is obvious that this is only a reiteration of the uniformity of nature on its dynamic side. It is that nature is uniform in its sequences. Complete the law by one of the uniformity of co-

existences and we shall have the full postulate of the uniformity of nature. Since the law of cause and effect is a law of sequences, thus bringing to the front the idea of motion, the most prominent notion involved is that of the persistence of moving force and from the latter it may be regarded as explicated.

THE CORRELATION AND EQUIVALENCE OF FORCES.

§ 15. *Forces are mutually convertible at given rates; and in the conversion no force is lost.*

The latter part of this law is manifestly a statement of the persistence of force; but the connection of this latter part with the remainder and that remainder itself require some further observations. By a conversion of one force into another we mean that a present manifestation of force ceases and is followed by another manifestation of force equivalent in quantity and that the two are mutually convertible. When the ball strikes the solid rock the motion seems to abate but the surrounding atmospheric temperature is raised; we say then that the mechanical force or some of it is converted into heat. This proposition analysed means that force as manifested to one sense becomes manifested to another or others. The doctrine of the conversion of forces imports then that forces under given circumstances alter as to their mode of presentativity and that these modes may pass into each other under certain conditions. That is to say the dynamical qualities of body manifest themselves in co-extension and succession according to our modes of sensation and without loss of force. Given the persistence of forces and also a plurality of modes of affecting consciousness; then we shall have occasion to note uniformities of correlation and equivalence. The law of presentativity and the law of force then give us the law of the correlation and equivalence of forces; that is to say these two laws are the most prominent of the principles lying at the foundation of the correlation and equivalence of forces, for the other fundamental laws which we have found are in reality not less concerned.

§ 16. One of these other laws is very intimately concerned. I refer to the principle of nature's uniformity. Our statement of the law of cause and effect (§ 14) named the latter as an expression of the uniformity of sequences and referred to a complementary law of the uniformities of co-existence as needed to make a full equivalent to the doctrine of the uniformity of nature.

Such a law of the uniformity of co-existences is found in the proposition now before us. The law of action and reaction, the laws of motion, the law of cause and effect presented respectively different aspects of the persistence of force in space. We now see that same persistence exhibited in the co-existence of forces. At first thought it would seem as if the doctrine of correlation and equivalence was a law of sequences instead of co-existences. This impression is deepened by some of the language used commonly in explaining that doctrine. We are accustomed to hear it said that one force disappears and another succeeds it, the former being transmuted into the latter. From this statement we are apt to infer that the prior force is annihilated and that the new force is all that is left. But a very little reflection must convince us that so to believe is to deny the persistence of force and in order to establish any correlation and equivalence we must regard the former force as co-existing with the latter. For a force to be correlated with another we must suppose the existence of that other, else something could have relation to nothing, which however is an impossibility. This correlation consists of a force under one mode of presentativity being equivalent in quantity to and convertible into a force under another mode of presentativity; and an essential part of the idea is that whereas B is esteemed the equivalent of A which preceded it, B is so related to A that B may be converted into A again, or that B may become the antecedent and A the consequent. This implies the co-existence of the two, the order of succession being reversible. In other words B and A are related as the red and white sides of a railway switch signal. When the red side B is before us we suppose co-existing with it a white side A which may be made apparent by turning the switch. The two sides will appear alternately by turning the disk. Neither A nor B is destroyed when it disappears but the one disappearing is replaced by its correlative which in turn may be brought before consciousness by reversing the process. Let us take the common example of the transformation of force—that of motion into heat. To say that a given amount of heat as indicated by raised temperature on arrest of motion is equivalent to a given amount of motion supposes that amount of motion remaining constant somewhere in order that we may make comparison. Under proper conditions we should find this amount of motion existing and equivalent to the given amount of heat, and under suitable conditions moreover the heat could be reconverted into the motion. If either

had passed into nothing we could not make such a supposition; and correlation postulates the co-existence of things correlated. This whole line of thought is borne out by the results of that series of inquiries which established that heat is a mode of motion. The motion which seems to be destroyed when one body impinges upon another and is arrested upon closer examination is found to be still existing among the molecules of the two bodies and surrounding bodies. Wherever there is heat, there is motion. Similarly light, sound, electricity, magnetism, and other forces have been resolved or practically so into modes of motion; that is wherever light, sound, electricity and so forth occur, there occurs also motion. Now it must be held in mind that motion is not a concrete but an abstract. By motion we mean force moving, or force manifested to our consciousness through the muscular sensibility. But no amount of muscular apprehension can give the sensation of heat or of colour. These last are distinct modes of knowledge and not resolvable into anything else. The sense of heat is not that of muscular tension or pressure nor the converse. No more is light, nor odour, nor sound. When we say, therefore, that heat is motion or that sound is motion we go beyond what our experience warrants. We only mean that co-existing with a certain degree of the sensation called heat, there is a certain degree of the sensation called motion; in other words that the two are correlated. Heat, sound, electricity, light may be called *modes* of motion, that is of moving force, but they are not motion alone; they are *hot moving force*, *sounding moving force*, *electric moving force*, *luminous moving force*, and no experience transforms the *hot* into the *sounding*, the *electric* into the *simply luminous*. The most we can declare is the co-existence of a given quantity of heat with a given quantity of electricity or a given quantity of light with a given amount of heat. The two forces co-exist; on the one side the force is heat or light, on the other electricity or heat: the order of sequence can be reversed and the two thus appear mutually convertible. We have seen that the experience we have of force necessitates the doctrine of the indestructibility of motion. If then moving force cannot be destroyed, it is equally true that hot force or luminous force cannot be destroyed. Though the light or heat may disappear and be succeeded by other phenomena, we are compelled to think them still existing and that under similar circumstances they would recur (Chap. XIV. § 5). When therefore we predicate of a succeeding force equivalence

with its antecedent our correlation rests on the co existence of the two and our predication declares a uniformity of co-existence. Thus crossing the lines of sequences of things in nature are lines of co-existence binding the chains of sequences together laterally as the warp and woof of a web.

§ 17. Carrying our thought a step further we shall make it evident to ourselves that we cannot conceive of sequence without postulating co-existence. For sequence means change of position, which implies two things passing by a third remaining stationary; that third is the perceiving subject which is the standard of estimation. At every moment then there must co-exist this subject C either with the antecedent A or the consequent B; so if D, E, F, and G, follow, still there must always be co-existent the subject C. The sequence then is not A, B, D, E, F, G, but AC, BC, DC, EC, FC, GC. Putting this with the further facts before noticed that forces always imply and occur with spaces and that one force always postulates another, these facts showing that our notion of co-existence is primordial (Chap. XIII. § 5; Chap. XII. § 15), we shall readily see that even in the midst of sequences there must be co-existences. It will then be easier for us to apprehend how correlation of forces is but expressing these uniformities of co-existence.

§ 18. Taking together the uniformities of cause and effect—uniformities of sequence, and the uniformities of co-existence in correlation and equivalence, the full import of the law of nature's uniformity will be clear. Our experience of material things as respects its sameness and difference depends upon the constancy and variation of the circumstances—those circumstances being the antecedents and co-existents of the given experience. But though this is a generalisation of universal experience, it is nevertheless a datum of knowledge itself, being so universal as to be in every experience. All knowledge postulates that there is this uniformity and variation and unless it be first postulated we can make no general affirmation whatsoever. The consistency of experience depends upon it and without this consistency and uniformity all knowledge vanishes.

§ 19. The last Chapter (§ 1) asserted that the science of somatology consists of general expressions of uniformities in nature. The laws of cause and effect comprise the uniformities of sequence. The laws of the correlations and equivalence of forces furnish the uniformities of co-existence. A large part of science

must always be occupied with the ascertaining of these latter uniformities and this branch is of fully as much importance as the other. Science never can be complete and perfect till all these connections are plainly and thoroughly exposed. And I venture to predict that the number of ultimate, unanalysable, indestructible forces will be found in the end to be exactly coincident with the number of ultimate, unanalysable modes of sensibility, and will be precisely correspondent to those several modes. The respective conditions then of equivalence of force manifested in one ultimate mode with force manifested in each of the others will furnish, when they are found, the highest and most complete laws of correlation and give the most exact science of nature's uniformities of co-existence.

THE LAW OF EVOLUTION AND DISSOLUTION.

§ 20. *There is in nature a course of integration of forces from indefiniteness, simplicity and homogeneity in their relations, to definiteness complexity and heterogeneity; and a reverse movement from the definite, the complex and the heterogeneous to the indefinite, the simple and the homogeneous.*

A re-examination of the postulate of force (Chap. XVI. § 10) will now disclose the fact that we have found partial and subordinate laws to express separately all the aspects of forces in spaces with respect to each other except one pair. The law of action and reaction, the law of the direction of motion, the law of the rhythm of motion and the law of cause and effect have expressed the truth of forces equal and unequal mutually acting and reacting in motion and at rest; the fact of persistence both as moving and as resting is amply indicated in the law of the persistence of force, the indestructibility of matter, the consecutiveness or persistence of motion, and the inertness of rest; while the truths of co-existence and sequence are exemplified in the law of cause and effect and the law of the correlation and equivalence of forces. There remains only the notion of attraction and repulsion, of which we have no definite principle less general than the expression of the fact as a constituent part of all force. Postulating that there are in all forces and hence in all matter attractions and repulsions what is the law of their manifestation and procedure? This question is answered by the law of evolution and dissolution.

§ 21. In our examination of the notions involved in the idea of forces (Chap. XII. § 13, 14) we noticed that on their dynamical

side forces are co-attractive and repulsive; while on their statical side the same relation can be expressed by the terms *aggregative* and *separative*. The attractive forces of nature working dynamically tend to produce statical aggregates which in their turn by repulsive forces are separated and dispersed. The formation of these aggregates, or the integration of forces, is what is characterised under the term *Evolution*, and the dispersion of them, or the disintegration of forces, is expressed by the correlative term *Dissolution*. That there are evolution and dissolution at all follows from the law of force; and that the course of evolution in nature is as stated in the above law is also deducible from the law of force, and its implications of the other postulates which we have seen are of equal universality. This appears from the following considerations.

1. Homogeneity is unstable and inevitably lapses into heterogeneity. 'In three several ways does the persistence of force necessitate this. Setting external agencies aside each unit of a homogeneous whole must be differently affected from any of the rest by the aggregate action of the rest upon it. The resultant force exercised by the aggregate on each unit, being in no cases alike in both amount and direction and usually not in either, any incident force even if uniform in amount and direction cannot produce like effects on the units. And the various positions of the parts in relation to any incident force preventing them from receiving it in uniform amounts and directions, a further difference in the effects wrought on them is inevitably produced. One further remark is needed. To the conclusion that the changes with which Evolution *commences* are thus necessitated remains to be added the conclusion that these changes must *continue*. The absolutely homogeneous must lose its equilibrium; and the relatively homogeneous must lapse into the relatively less homogeneous. That which is true of any total mass is true of the parts into which it segregates. The uniformity of each such part must as inevitably be lost in multiformity as was that of the original whole and for like reasons. And thus the continued changes which characterise evolution, in so far as they are constituted by the lapse of the homogeneous into the heterogeneous and of the less heterogeneous into the more heterogeneous, are necessary consequences of the persistence of force.'[1]

2. The action of forces upon each other necessarily produces a

[1] Spencer's *First Principles*, Part II. Chap. XIX.

multiplication of effects and thus a greater complexity. Action and reaction being equal and opposite it follows that in differentiating the parts on which force falls in unlike ways, the incident force must itself be correspondingly differentiated. Instead of being as before a uniform force, it must thereafter be a multiform force—a group of dissimilar forces. An incident force decomposed by the reactions of a body into a group of unlike forces—a uniform force thus reduced to a multiform force—becomes the cause of a secondary increase of multiformity in the body which decomposes it. Each differentiated division of the aggregate thus becomes a centre from which a differentiated division of the original force is again diffused. And since unlike forces must produce unlike results, each of these differentiated forces must produce throughout the aggregate a further series of differentiations. This secondary cause of the change from homogeneity to heterogeneity obviously becomes more potent in proportion as the heterogeneity increases. When the parts into which any evolving whole has segregated itself have diverged widely in nature, they will necessarily react very diversely on any incident force—they will divide an incident force into so many strongly contrasted groups of forces. And each of them becoming the centre of a quite distinct set of influences must add to the number of distinct secondary changes wrought throughout the aggregate. Every additional specialised division is an additional centre of specialised forces. If a uniform whole in being itself made multiform by an incident force makes the incident force multiform ; if a whole consisting of two unlike sections divides an incident force into two unlike groups of multiform forces ; it is clear that each new unlike section must be a further source of complication among the forces at work throughout the mass a further source of heterogeneity. The multiplication of effects must proceed in geometrical progression.[1]

3. 'A uniform force falling on any aggregate produces unlike modifications in its different parts—turns the uniform into the multiform and the multiform into the more multiform. The transformation thus wrought consists of either insensible or sensible changes of relative position among the units, or of both—either of those molecular rearrangements which we call chemical, or of those larger transpositions which are distinguished as mechanical or of the two united. Such portion of the permanently

[1] Condensed from *First Principles*, Part II Chap XX.

effective force as reaches each different part or differently conditioned part may be expended in modifying the mutual relations of its constituents; or it may be expended in moving the part to another place; or it may be expended partially in the first and partially in the second. Hence, so much of the permanently effective force as does not work the one kind of effect must work the other kind. It is manifest that if, of the permanently effective force which falls on some compound unit of an aggregate, little, if any, is absorbed in rearranging the ultimate compounds of such compound unit, much or the whole must show itself in motion of such compound unit to some other place in the aggregate; and conversely if little or none of this force is absorbed in generating mechanical transposition, much or the whole must go to produce molecular alterations. What now must follow from this? In cases where none or only part of the force generates chemical re-distributions what physical re-distributions must be generated? Parts that are similar to each other will be similarly acted on by the force; and will similarly react on it. Parts that are dissimilar will be dissimilarly acted on by the force; and will dissimilarly react on it. Hence the permanently effective incident force when wholly or partially transformed into mechanical motion of the units will produce like motions in units that are like and unlike motions in units that are unlike. If then in an aggregate containing two or more orders of mixed units those of the same order will be moved in the same way and in a way that differs from that in which units of other orders are moved, the respective orders must segregate. A group of like things on which are impressed motions that are alike in amount and direction must be transferred as a group to another place and if they are mingled with some group of other things on which the motions impressed are like each other, but unlike those of the first group in amount or direction, or both, these other things must be transferred as a group to some other place—the mixed units must undergo a simultaneous selection and separation.'[1]

§ 22. From these considerations the course of evolution is made plain as a deduction from the law of force. And given evolution dissolution necessarily proceeds in reverse order, undoing what evolution has accomplished in its progress.

§ 23. The limit of evolution is reached in an equilibrium. 'The forces of attraction and repulsion being universally co-

[1] *First Principles*, Part II Chap XXI

existent, it follows * that all motion is motion under resistance. Units of matter, solid, liquid, aëriform or ethereal, filling the space which any moving body traverses, offer to such body the resistance consequent on their cohesion or their inertia, or both. In other words the denser or rarer medium which occupies the places from moment to moment passed through by such moving body having to be expelled from them, as much motion is abstracted from the moving body as is given to the medium in expelling it from these places. This being the condition under which all motion occurs, two corollaries result. The first is that the deductions perpetually made by the communication of motion to the resisting medium cannot but bring the motion of the body to an end in a longer or shorter time. The second is, that the motion of the body cannot cease until these deductions destroy it. In other words movement must continue till equilibration takes place; and equilibration must eventually take place. Both these are manifest deductions from the persistence of force. To say that the whole or part of a body's motion can disappear save by transfer to something which resists its motion is to say that the whole or part of its motion can disappear without effect; which is to deny the persistence of force. Conversely, to say that the medium traversed can be moved out of the body's path, without deducting from the body's motion, is to say that motion of the medium can arise out of nothing; which is to deny the persistence of force. Hence this primordial truth is an immediate warrant for the conclusions that the changes which evolution presents cannot end until equilibrium is reached and that equilibrium must at last be reached.'[1]

§ 24. 'An evolving aggregate, while on the average losing motion and integrating, is always in one way or other receiving some motion and to that extent disintegrating; and after the integrative changes have ceased to predominate, the reception of motion, though perpetually checked by its dissipation, certainly tends to produce a reverse transformation and eventually does produce it. When evolution has run its course—when the aggregate has at length parted with its excess of motion and habitually receives as much from its environment as it habitually loses—when it has reached that equilibrium in which its changes end; it thereafter remains subject to all actions in its environment which may increase the quantity of motion it contains, and which in the

[1] *First Principles*, Part II. Chap. XXII.

lapse of time are sure, either slowly or suddenly, to give its parts such excess of motion as will cause disintegration. According as its equilibrium is a very unstable or a very stable one, its dissolution may come quickly or may be indefinitely delayed may occur in a few days or may be postponed for millions of years. But exposed as it is to the contingencies not simply of its immediate neighbourhood but of a universe everywhere in motion, the period must at last come when either alone or in company with surrounding aggregates it has its parts dispersed.'[1]

§ 25. The wide scope and the great importance of the law of evolution are seen at a glance. It includes all changes in the material universe, past and to come, and is a generalisation of the whole course of nature. A detailed exposition of the law of evolution and dissolution is a complete natural history; the law is an expression of the lines of change and progress in nature; by means of it nature can be fully expounded and a science of nature made perfect. It is the most comprehensive and altogether the grandest generalisation that has ever been made in human science.

§ 26. Some of the relations to each other of the laws of nature which we have examined will be perceived in the following scheme:

Laws of Bodies in Equilibrium. Laws of Bodies Statical. Laws of Co-existence.	The Inertness of Rest. The Law of Action and Reaction. The Correlation and Equivalence of Forces.
Laws of Bodies not in Equilibrium. Laws of Bodies Dynamical. Laws of Sequence.	The Laws of Motion. The Law of Cause and Effect. The Law of Evolution and Dissolution.

Behind these two divisions and applying equally to them are the distinctions of (1) Quantity (Equality and Inequality) and (2) Existence or Quality (Modes of Presentativity). Reducing all to their simplest forms, then, we have four general classes of uniformities of nature: (1) Uniformities of Quantity; (2) Uniformities of Existence or Quality; (3) Uniformities of Co-existence; (4) Uniformities of Succession.

[1] *First Principles*, Part II. Chap. XXIII.

CHAPTER XVIII.

CRITICISMS.

SPACE.

§ 1. After a course of exposition which develops statements of truth differing, to a very considerable degree, from the ordinary doctrines on the subjects especially of force and space; the reader may fairly demand a reconsideration of those subjects to the end of discussing them somewhat more argumentatively and comparing the views here advanced with those which have been held by other thinkers. The true nature of space and its relations to force is the first and the chief problem with whose solution we have been concerned, and to this we will again address ourselves.

§ 2. The majority of philosophical writers have drawn a distinction between space and matter or body. To nearly all thinkers matter has been one thing and space an altogether different thing. Whether they declare with Kant that space is purely subjective and is an à priori form of all external sensation; with Sir William Hamilton that it is both an à priori necessary condition of the possibility of thought and under that we have an à posteriori or adventitious percept of it as contingently apprehended in this or that actual complexus of sensations; or with Herbert Spencer that it is the abstract of all co-existences—all agree that space at least is not matter or body. The question then naturally arises, What is space? And here we commence to note the divergence of philosophers. The disputes centre chiefly about the inquiry whether or not space has an objective reality. Those who have discussed the subject have not been clear always nor consistent in their use of the terms *objective reality*, and the student finds it imperatively necessary to ascertain the meaning of those terms before he can intelligently follow the course of polemics or expositions. But the idea intended to be conveyed is, broadly, existence outside of the mind in the same sense as any material object—a tree, a house, or a stone, exists outside the mind. Those who maintain the subjectivity of space can esteem it, as Kant did, a necessary à priori form of all external sensation, supplied by the mind to embrace and circumscribe matter, or, like Mr. Spencer, as an abstraction from experiences of body or matter. Those who, on the other hand,

assert the objectivity of space, must, so far as I can see, either make it out to be a sort of *tertium quid* in which matter is contained, or to be itself a kind of matter. As before stated, the most of thinkers believing in the objective reality of space have chosen the first of these two alternatives.

§ 3. All of these suppositions have objections to them. The great difficulty with the Kantian doctrine is that there is no more reason for holding to the subjectivity of space as formal than there is for the subjectivity of the material as well. If space which seems to contain body is subjective, why is not that which is contained subjective also? How can we be certain that if the mind supplies the form it does not also supply the matter? We cannot understand motion except as body altering position in space, and if that in which body moves and which is necessary to the idea of motion is in the mind solely, why is it not true that the moving body is mental also and without objective reality? Berkeley thought that material objects have their sole existence in the perceiving mind, and afterward the Kantian idealists held somewhat similar views; but as a rule thinking minds cannot go as far and thus consider that there must be something wrong in the position they took which seems to render such conclusions reasonable.

§ 4. Mr. Spencer's doctrine goes no farther toward establishing the subjectivity of space than to make it evident that the *notion space* is subjective. Every abstract implies a concrete, and to understand what the abstract is we must refer to the concrete. Mr. Spencer says our notion of space is built up of experiences of force. Muscular adjustments met by resistance occur and again muscular adjustments unopposed by resistance; out of these latter grow the notion of space. We have given in experience then sensations of resistance and of non-resistance; the one presents matter, the other space. But the human body, from the motion of whose parts this sensation of non-resistance arises, is objective and outside of the mind: the idea of space hence does not originate in the mind or relate solely to subjective experiences but comes directly from objective experiences. *Space* on Mr. Spencer's theory is an abstract of mental experiences generated by something without.

§ 5. Assuming the objective origin and reality of space, we are perplexed by any supposition which looks to the establishment of a reality which is not mental and not material, but some unknown thing as a medium of communication between mind and matter.

Again, if space be matter we seem to destroy entirely the character of both, since we suppose matter to be impenetrable and yet body to occupy space.

§ 6. It is very evident that the only way to get any clear comprehension of what we mean by space and of what its relations are to mind and matter is to examine the primitive experiences out of which the notion springs. Such an examination has been most thoroughly made by Professor Bain and less completely by Brown, and the results of their analyses, as thus summed up by J. S. Mill,[1] indicate just what the experience is which lies at the root of this universal notion.

'The sensation of muscular motion unimpeded constitutes our notion of empty space, and the sensation of muscular motion impeded constitutes that of filled space. Space is Room—room for movement; which its German name *Raum* distinctly confirms. We have a sensation which accompanies the free movement of our organs, say for instance of our arms. This sensation is variously modified by the direction and by the amount of the movement. We have different states of muscular sensation corresponding to the movements of the arm upward, downward, to right, to left, or in any radius whatever, of a sphere of which the joint that the arm revolves round forms the centre. We have also different states of muscular sensation according as the arm is moved *more*, whether this consists in its being moved with greater velocity, or with the same velocity during a longer time; and the equivalence of these two is speedily learned by experience. These different kinds and qualities of muscular sensation experienced in getting from one point to another . . . are all we mean by saying that the points are separated by spaces, that they are at different distances and in different directions.'

In our experience of the external world we have, it thus appears, two general groups of sensations, one of unimpeded motion, the other of motion arrested or resisted; in other words, the two sensations, the one of extension or the vacation of resistance, and the other of resistance. When we have a sensation of motion arrested or resisted we have a sensation of what we are accustomed to call body; when we have a sensation of motion beginning and resistance giving way we have the sensation of extension, or emptiness of body, as the term *body* is ordinarily employed.

[1] *Exam. of Sir W. Hamilton's Philos.* Chap. XIII.

Associating the former sensations we have *forces*; the latter are absences of resistance or *spaces*.

§ 7. In the first place it should be carefully noted that these experiences of absence of resistance are not experiences of an absence of all sensation but merely of an absence of the sensation of resistance. We distinguish by our sensations that there is now a resistance and now a vacation of resistance. The non-resistance is *felt* to be different from the resistance and conversely.

§ 8. We have already observed in several places (Chap. XII. § 10, especially) that experiences of resistance and non-resistance always occur together and that the existence of the other is necessary to our idea of either one. We do not know resistance at all save by distinguishing it from a non-resistance of which we have experience also or of which we have had experience. Resistance means non-extension and extension means non-resistance; resistance and extension are relative names as essentially as parent and child or debtor and creditor. If there never were any motion, resistance would never be a sensation or come within our ken; and in like manner if there never were any resistance we should have no acquaintance with or apprehension of extension and non-resistance. Hence resistance is always manifested to our minds as a something limited by non-resistance; and extension on the other hand as something limited by resistance.

§ 9. There are thus presented for mental representation these two great classes of sensations, namely of resistance and vacation of resistance, relative non-resistance, or extension. The mind groups together all its experiences of resistance and in the first place its tactual sensations of resistance vacating. It is not the proper place to go into a detailed exposition of the relations of sight to touch and to analyse the ideas of distance and visual space. We must, however, anticipate the conclusion that all these latter notions, including the entire apprehension of distance and dimension by sight, arise from association of experiences of touch and muscular pressure. The distance which I seem to see between myself and the house yonder is apprehended and measured by a mental association with the experience of walking to that house or reaching out my arm to it so as to touch it. And when I see the house, I infer it to be a resisting object by its similarity in visual appearance to other objects which I have found by the muscular sensibility to be resisting objects. In like manner I cognise what I call a space between this particular house and the

next one across the street by an inference that if I were on the spot, between those houses I could move without experiencing resistance, but as I struck either wall the non-resistance would pass into or be superseded by resistance. Many experiences have taught me that surfaces such as I see in these perpendicular brick walls mark the limitations of resistance and the points where non-resistance begins, and that between the two there is enclosed a non-resisting space. Associating together all these experiences, we form a group of spaces, having the common attribute non-resistance. Associating together resistance-experiences under their various forms both statical and dynamical, we create a group whose common attribute is force and whose members are hence termed forces.

§ 10. No one disputes the origin of force-ideas in sensations. It seems to me that a careful examination of the subject pursued in the directions of which I have now given the outline must make it clear that our space-ideas have also their origin in sensations. There remain questions of the mutual relations of these two great divisions and of the respective substantial grounds to which they are to be severally attributed. To deal with these we must call to mind another phase of the original sensational experience of resistance and relative non-resistance. Resistance is resistance to motion, that is resistance to body moving, that is a resistance to another resistance. All of our experiences of resistance are experiences of at least two separate and distinct resisting bodies, one of which is moving. But all our limitations of resisting bodies are determined by non-resistances. A body is known to be a separate and distinct thing solely by the termination of a resisting surface. Thus the primitive sensational experiences are of two resisting things, one at any rate moving, each of which is bounded, limited, and thus known by non-resistance.

§ 11. Now when we come to associate and integrate these experiences what is the result? So far as forces are concerned the result is a group of individuals with the attributes of mobility and resistance common to them things which can move and resist other things impinging upon them. Considering the attributes apart we have the quality of impinging and resisting; in other words *Force*. Upon the other side there is a group of individuals with the common attributes of non-resistance and immobility. Regarding apart the attributes non-resistance and immobility, there appears the quality of containing or furnishing room for force; in other words *Space*.

§ 12. If it be certain that our ideas of space are equally with our ideas of force derived from sensations and formed by generalisation and abstraction from sensational experiences, then space and force are precisely on a par as regards their reference to a substantial reality. A force-sensation is a thing and a space-sensation is a thing. If a force is an external reality so also is a space. If there is an unknown substance which the mind postulates under the sensation of a force there is likewise an equivalent postulate made with regard to its complementary sensation of a space. And if this postulate in the one case supplies a Non-Ego ground, it must also do the same in the other. Once concede that the notion space arises from sensations of non-resistance given with sensations of resistance and there is no escape from the conclusion that there is a Non-Ego substantial ground for the former as well as the latter. And since force and space mutually exclude each other but yet are always presented together, matter is always exhibited as a substance with its two sides or modes of force and space, the one the complement of the other. The material atom must include space with force and space is as much matter as is force.

§ 13. I have thus re-stated in brief the doctrines of the preceding chapters before making a few comments upon the other views which have prevailed as to the nature and mutual relations of space and the forces which seem to operate in space. The conclusions arrived at are (1) that spaces are realities external to the mind from which the intellectual activities construct the abstract notion space; and (2) that spaces are not something different from body or matter but *are* matter and are as essential to the idea of matter as are forces, space and force being its opposite and complementary sides. I do not propose exhaustively to review the protracted and voluminous discussions that have taken place over questions of the objectivity and subjectivity of space. The Berkeleian principles certainly have not been universally received, nor have the Kantian doctrines carried out into idealism ever conquered the philosophical world. Kant's own exposition of space begins with a wholly erroneous assumption, namely 'Space is not a conception which has been derived from outward experiences.'[1] On the contrary the whole course of recent investigation into the origin of this conception goes to show precisely that it is derived from outward experiences. Starting out with a flat denial of Kant's first premise, we cannot expect to find much to favour in his

[1] *Critique of Pure Reason*, Part I. Sec. 1.

reasoning and conclusions. Moreover it is not at all true, as I shall endeavour to show in a succeeding chapter, that the necessity or universality of any ideas prove them to have their origin anywhere else than in experience; their necessity consists in the fact that they are supported by a universality of experience. Hence the only way to ascertain precisely what any ideas are and what are their relations to other ideas is to investigate and analyse the experiences in which they are exhibited. We have already followed such a method with the notion of space and find it indeed true, as Kant maintains, that the idea of space is necessary to the idea of any objects whatever existing without the Ego, but, unlike Kant, consider this as going to prove that the necessity is not à priori but comes from the fact that space is a universal constituent of the material universe and as much an attribute of matter as is the force which forms objects in space. The fact that there are objects having existence outside of the perceiving Ego establishes the objectivity of space, for the mind has no presentation or representation of such objects except as in space; their extension is one of their primary qualities. We have no capacity to think of external objects except as in space. We cannot regard this space as in the mind, for then we destroy also the externality of the objects in space. Hence if it be true that there are any external material objects whatever, it is also true that the spaces in which they lie or which bound them are likewise external.

§ 14. Here, it seems to me, is Mr. Spencer's error. His argument against Kant's doctrine of space as a 'pure intuition' à priori and antecedent to experience is thorough-going and conclusive.[1] So also his exposition of the manner in which our notion of space is built up from original experiences of motion. But as he reduces motion or body moving to the more ultimate experience of force, he unconsciously eliminates the space elements of the experience. At the bottom we have nothing left but force, and space is not an external reality but an ideal reality, a mental abstract of co-existent experiences of force. The only thing Non-Ego then is force which furnishes the material from which by abstraction a mental notion or conception called space is generated. Now I am unable to understand how by any process of abstraction from experiences simply of force, we can arrive at a notion of space. An abstract is the notion or idea of an attribute considered by itself, apart from the concrete object with which it was originally con-

[1] *Principles of Psychology*, Part VI. The Perception of Space.

nected. Two objects are seen to agree in a certain particular; this particular is taken as a common property of the two things and a name given to it: such a name is an abstract name. Two brick walls are alike in colour; their common attribute is named *redness*, the notion of which is reached by an abstraction of the common quality and by creating an individual mental entity of it. *Redness* exists only in the mind, but the objects from which the abstraction came are always red objects. Mr. Spencer would doubtless concede that the experience of resistance is at the foundation of the notion of force. He would also agree that our primary experiences are, relatively speaking, experiences of resistance and of non-resistance. Furthermore it is not too much to ask him to allow that resistance so far forth as it is resistance and non-resistance so far forth as it is non-resistance mutually exclude each other. There is nothing in common between resistance and non-resistance. If then we take two co-existent experiences of impinging and resisting bodies, we are able to note a common attribute of capacity for resistance and impingement, which we call *force*; but we do not discern in the resisting bodies or in any number of them together, so far forth as they are resisting, any attribute of non-resistance. Carry our abstraction as far as we please we can get only attributes of force. From force-experiences alone we can obtain nothing but force. If Mr. Spencer's co-existences are co-existences of force-bodies, then the only way in which he can obtain space by abstraction is not by prescinding an attribute from the concretes, for no such attribute is there, but solely by removing wholly the concrete experience itself and substituting another for it. And this is precisely what he does. 'Our consciousness of space is a consciousness of co-existent positions. Any limited portion of space can be conceived only by representing its limits as co-existing in certain relative positions; and each of its imagined boundaries, be it line or plane, can be thought of in no other way than as made up of co-existent positions in close proximity. And since a position is not an entity since the congeries of positions which constitute any conceived portion of space and mark its bounds are not sensible existences; it follows that the co-existent positions which make up our consciousness of space are not co-existences in the full sense of the word (which implies realities as their terms) but are the blank forms of co-existences left behind when the realities are absent; that is, are the abstracts of co-existences . . . . . . And from a building up of these too elaborate to be

here detailed results that abstract of all relations of co-existence which we call space.'[1] Our author places, as it were, a black and white object side by side and next to them a like pair; he then tells us that he will abstract the attribute whiteness from the black couple; this he does by removing entirely the black pair and afterward prescinding from what remains the common attribute of whiteness; *then he asserts that whiteness is the abstract of all co-existing black objects!* Of course this is illegitimate. We cannot obtain space excepting by abstraction from some concrete experiences which have attributes of non-resistance, that is space attributes; and it is not force-experiences which furnish such attributes, but space-experiences which are of equal reality and originality with the former. These experiences occur always together and are complementary to each other. Resistance means nothing except as correlated with non-resistance, and the converse; but the two groups of phenomena cannot be amalgamated nor sublimated into each other. Space is the abstract of the one set and force the abstract of the other.

§ 15. It is scarcely worth our while to spend time upon an argument to prove the externality of so-called material objects in general. The mutual exclusion of Ego and Non-Ego objects is a fundamental datum which transcends proof. Unless this be postulated all science and philosophy fail; and it *is* postulated not only in all science and philosophy but in every act of cognition. Without it consciousness itself ceases to be. It is the beginning and the end of all experience whatsoever.

§ 16. If it appear that spaces have external reality, that branch of the inquiry opens up which has reference to the relations of space to matter. If space is not of the Ego, is it matter or is it a something else, neither matter nor mind? In order to establish that it is not material it is necessary to make out that the notion does not arise from sensational experience, for whatever is apprehended by sense-perception and hence comes through sensation, is admittedly a manifestation of matter. Therefore recourse has been had to a doctrine of intuition by some faculty supra-sensible which is assumed to know space as an external entity. We shall discuss the claims of such a philosophy as this to our favour at a later stage;[2] and I trust we shall become satisfied, negatively, that there is no ground for assuming or predicating any such faculty; and positively, that intuition is either of ideas within or sense-percepts without. Hence we are thrown back upon sensations for our

[1] *First Principles*, Chap. III. [2] See Chap. LVII. post.

knowledge of an external space and thus are forced to dismiss the hypothesis of a *tertium quid.*

§ 17. We are thus obliged to conclude that space is a material entity, which does not indeed appear alone in experience and which is always correlative to force, but which may be thought as separate and distinct. A cognition, for example, is a mental entity whose ground is the subjacent Ego; it never occurs in experience except in connection with a feeling; a cognition is one side of an experience of which feeling and volition are the other correlated sides. In like manner a space does not occur except as limited and defined by forces; it is one side of an experience of which two forces are the other sides; the common ground of these correlated phases is the Non-Ego, but each is a distinct real experience, a half experience if you please, but still capable of being classed as distinct and separate yet indissolubly associated with its correlate. The sum of these experiences is matter; on the one side space, on the others force.

§ 18. When we proceed to reduce matter to its minima, it is obvious that we have to deal with a plurality of atoms and that each of these atoms consists of two forces circumscribed and separated by a space. The theory of Democritus and the Atomists in its essential idea has never been overthrown. Atoms in order to be atoms must be mutually limited and separated, and the something which accomplishes this object is the void space between them. But, the Atomists held, since the void space is one determination of being, it must possess objective reality, no less than the atoms. And the argument by which they supported their claim that *vacuum* existed as a reality no less than being and was no less essential as an ἀρχή, was simply the conclusive argument that without it motion would be impossible.

§ 19. One great hindrance which has been experienced in the attempt to arrive at correct ideas of space, has been this same proneness to consider space as a void. It has seemed to be wholly negative, so much so that it has frequently been treated as identical with nothing. We are often told that if we take away everything from a given place a vacuum or space remains. Now a little reflection makes evident the fact not merely that nature abhors a vacuum but that the mind has no power to conceive a void. In the attempt it gives form and consistency to that to which it professes to deny all attributes. The moment we essay to think of a nothing we erect it into a something. Moreover, the

argument of Democritus ever recurs with all-powerful strength. Assume space to be a void and you deny the possibility of motion. There is no means of bridging a vacuum either in the world outside or in the thought, nor is there any way of leaping across it. No relations can be established with nothing;—no co-existence, no sequence in a vacuum—all of which is but another manner of saying that a vacuum is a pseud-idea and cannot be thought by the mind. Hence space is not wholly negative but has its own reality and its own attributes and qualities. The existence of force itself as a reality implies the existence of space as a reality also. We cannot exclude the idea of motion from force, and that there may be motion there must be room for movement. If the motion is real the room must be real, since motion implies such room; and if the motion is external to the perceiving mind so must be its correlative room for motion, inasmuch as the motion is known and defined by its successive places, and were these in the mind, the motion must be there also. Moreover we cannot understand anything of force in motion except we know these places as permanents. There is no sequence conceivable without reference to something which moves not. This necessary element in the idea is not supplied by the thought of forces at rest, for that is merely the notion of forces balancing each other, each moving against the other in action and reaction. Such bodies at rest determine place to be sure, but they do not supply the necessary correlative of motion, for they have the full capacity for motion. That correlative is only found in a space which is permanent and immobile, to which the idea of motion is wholly irrelevant.

§ 20. Another stumbling-block has been the doctrine that space is unlimited, whereas matter as contradistinguished from space is obviously limited. In order to see the error here, it is only necessary to recall that space is an abstract name whose concretes are particular spaces, every one of which, so far as our experience goes, is limited and bounded by resisting surfaces. Our only experience of the limitation of space is by something resisting. When therefore we look out upon the sky the limit of vision creates a boundary of space in an arched vault. Though we infer that what seems to be a resisting shell is not so, yet we only remove the resisting boundary farther away and at the end we are forced to erect it. Extend the non-resisting medium as far as we may, at last we place a limit and we have no other conception of limitation than that of a resisting body. Thus much for the limitations of space.

It is true, however, that we have no power to conceive of this final resisting boundary except as itself terminated and bounded by another space. There is an endless succession of resistances and non-resistances, to which there is no ability of the thinking subject to place a conclusion. Therefore, in this sense space is indeed unlimited, but no more so than is force and all matter. With the doctrine of the infinite extension of matter goes also the principle of the infinite extension of space with the meaning just indicated. The consecutiveness of motion is another part of the same truth. Motion goes on for ever and with the moving body there must go room for its movement, but there always comes a point at which the motion meets with resistance and its direction is changed: at such a point the space for movement is limited also. Prolong motion upon a given line as far as you can, finally you must stop; and there arises a limitation both of the motion and of the space containing it. Motion is indestructible, matter is indestructible, force is persistent and space is permanent—all these are different expressions of truth which mutually complement and imply each other. Matter can no more be conceived as susceptible of destruction than can force or space; and in the same sense that matter is regarded as infinitely extended, and in no other, is that aspect of matter we call space to be esteemed also as infinite. To both we put a limitation, and yet there is always an unlimited ever stretching out beyond.[1]

§ 21. As just remarked, it is frequently asserted that all the attributes of space are negative; and this claim demands some further discussion. That such is absolutely true cannot, however, be seriously maintained; for as we have also noted absolute negation is the absence of all conceptions and ideas whatever respecting any object. There must be some positive character to the notion, it thus seems manifest; and that sufficient attention has not been paid to the positive quality appears to me equally certain. Of course space is most obviously described or defined by the negation of resistance and motion: but *non-resistance* does not mark merely the absence of resistance but also the positive quality of extensiveness or ability to receive, contain, or admit motion. We have already observed that negation as applied to space does not and cannot mean negation of everything but only negation of force or resistance elements. We have likewise noticed that resistance and extension are correlatives, that resistance is known as some-

[1] Cf. Mill's *Analysis of the Human Mind*, Chap. XIV. Sec. 4.

thing which is not extension and extension is known as something which is not resistance ; moreover that body moving and room for body moving are in like manner mutually implied and mutually excluded. Hence when we speak or think of non-resistance, we do more than make a negative predication ; we assert positively the attribute, character and quality of affording room and capacity for motion. Unless this is true we can make no assertion or predication respecting motion and resistance. The same remarks apply to immobility as an attribute of space. Though the form of expression of this attribute is negative, a positive quality is predicated. For mobility and motion have no meaning and cannot be conceived or comprehended by the mind save as correlative to an immobility and permanence as positive as themselves.

§ 22. It will be seen readily enough that space cannot be a negation of everything, but the serious and important question then arises, when we attempt to give it a positive character, why it is that we are forced to think of it in terms of motion or mobile force. We say space is or has extension, which only refers us to a moving body; we speak of it as distinct and separable having its own coherence and consistency, all of which ideas are manifestly derived from the distinctness, separability, coherence and consistency of forces; we refer to it as containing force, a figure derived from the fluidity or liquidity of matter as force ; its exhaustive confluence and divisibility have a similar origin:[1]—in short we can only bring space at all into our thought in terms of that which space itself negatives, namely resistance. What then is the explanation of this singular contradiction? It is only an evasion of the difficulty to assert that language supplies no other means of expression. What is the cause of this defect in language? When there is an absence of terms, there is always a reason for such absence. The explanation in this particular instance lies farther back than is ordinarily supposed. It is found not merely in language but in the constitution of the human mind, which invents language for its own uses and conveniences to be sure, but never by language can transcend its own limitations. By space, as we discuss it, we mean of course space as it is to the apprehension of the human mind. Now every apprehension is a matter of mental cognition and every mental cognition is such only as it occupies a moment of time, that is there is no consciousness of anything except as it has a beginning, a middle, and an ending.

[1] See Chap. XII. Sec. 18 ff.

Every cognition distinguished and appreciated as such is a succession. The cognition of space or of a space is a succession from a beginning to an end. All our cognitions are such successions and consciousness itself is a ceaseless succession of cognitions, and without such succession there is no consciousness. So that form what idea we may of space, the moment we entertain that idea as an appreciable idea of our consciousness we have it only as one of a series in succession and itself as made up of instants of time. The application of these remarks is perceived when we draw our attention to the fact that these mental phenomena are described in terms of motion. *Successions* is a name given to mental experiences which are but representations of sensational experiences, and the term derives all its meaning from original experiences of sequences of mobile forces, that is from motion of force-bodies. If cognitions are always successions in a series and we have no other means of apprehending, comprehending or describing them, then it is at once seen how it is and why it is that all our cognitions of space must be in form and terms of moving body—that is of resisting body, for such is the only body of which motion can be predicated or to which it can be attributed. All our cognitions are successions in a series, else consciousness is blank and there is no consciousness; all mental successions are representations of sensational sequences; all sensational sequences are from movements of resisting bodies; therefore, if any knowledge be obtained of anything whatsoever in the world external to the mind, that knowledge must exist in the mind in terms of motion and resistance, that is to say in terms of force.

§ 23. Why then are we not entitled to dismiss space as a distinct entity altogether from consideration, merging it wholly with force? How are we justified in claiming for it an equal rank and dignity with the latter? Simply because succession itself postulates duration and is not intelligible without it. Successive moments in order to be appreciable at all must remain and have their own consistency in consciousness; otherwise there is no series and no succession; nothing, in fact. Though when we bring it before the mind as a mental object we do so in terms of succession, we all the while are obliged to postulate a duration as an equal mental reality in order that the succession may be possible. And in like manner we recognise that this duration is but a representation of sensational experience; that the sequences of material forces producing sensations must themselves have their

own consistency; that these sequences are not perceived, except as a permanent reality is also revealed with them, by which the sequences are alone made actual to sensation; that the sensation of motion carries with it the alternative sensation of room for movement —resistance and vacation of resistance—and that thus space is postulated as an external positive reality in nature, not force but of equal reality and materiality with force, a thing of the Non-Ego world, excluding from itself force, though cognisable only in terms of force. In last resort, indeed, the whole question resolves itself into that of the fundamental antithesis of the Ego and Non-Ego, each excluding and yet implying the other, Ego phenomena characterised by and expressed in terms of Non-Ego phenomena, but nevertheless the two sets of phenomena being the manifestations of two substances the independent reality of each of which is the first datum of philosophy, science and knowledge.

§ 24. Space then is not an empty void, or a vacuum, but is a material entity. Space is matter or body, and *a* space is a portion of matter or a body—a material thing. Space equally with force is originally a sensational experience and the experience of the one is the complement of the experience of the other. Both are necessary to any cognition whatsoever of an external world and to any conception of matter. Matter is not force alone nor space alone; but force and space. Take away space and there is no room for force; remove force and there is no defining character, no coherence nor consistency to space. If either force or space be removed absolutely, matter disappears and ceases not only to be actual in our experience but possible to our thought. Both force and space are by universal experience and thus by the primal necessities of thought indestructible realities, complementary to each other and in the totality of their manifestations and existence forming the material world.

We shall not go astray as to the nature and true character of space, if we constantly return to its original exhibitions in the earliest conscious experience and always remember that, in the significant words of Shadworth H. Hodgson, 'it is not an inference from the phenomenon but an inseparable aspect of the phenomenon itself.'[1]

There is great force also in the words of Sir John Herschel in review of Whewell. 'The reason, we conceive, why we apprehend things without us is that they *are* without us. We take it for

[1] *Time and Space*, Part I. Chap. II. Sec. 15.

[illegible] in [illegible]

[illegible] existence [illegible]

[illegible] and new [illegible]

[illegible]

[illegible] no sensation [illegible]

[illegible] n of succession [illegible]

[illegible] there were [illegible]

[illegible] would be [illegible]

[illegible] there would be [illegible]

[illegible] and succession [illegible]

[illegible] relations of [illegible]

[illegible] phenomena [illegible]

[illegible] material [illegible]

[illegible] perceptions [illegible] W [illegible]

[illegible] correctly [illegible] External [illegible]

[illegible] World, the [illegible]

[illegible] World.' Among [illegible]

[illegible] successive [illegible]

[illegible] number),[illegible] he says [illegible]

[illegible] of the surge [illegible] of Time [illegible]

succession [illegible]

[illegible] state, is a [illegible]

[illegible] noticed from [illegible]

[illegible] I have already [illegible]

[illegible] and certain [illegible]

[illegible] It tends to [illegible]

[illegible] and the Non-Ego [illegible]

[illegible] science. The [illegible]

[illegible] constituent element of [illegible]

[illegible] conceded. All feelings [illegible]

[illegible] succession. It [illegible]

[illegible] is a phenomenon [illegible]

[illegible] to the Non-Ego world; [illegible]

[illegible] phenomenon. Now if we have [illegible]

[illegible] motion and resistance, [illegible]

[illegible], either as of the mental [illegible]

[illegible] or as of the phenomena [illegible]

[illegible] from which we derive the notion Time [illegible]

[illegible] *Logic*, Deduction. Appendix.

attribution of duration or succession to external phenomena supersedes or does away with the notions of resistance and extension, permanence in space and sequence of forces. Thus it appears that the relations of bodies with each other, as apprehended by the mind, are not at all relations of time but relations of extension and co-existence.

§ 26. The point of intercommunication of the Ego and Non-Ego worlds lies in sensation. Every sensation has its mental side as feeling and its material side as revealing a cause or concomitant of the feeling lying outside the mind. When, therefore, we speak of an external world as enduring, we mean that our sensations of such a world endure, either in presentation or representation. Likewise, when we refer to material phenomena as succeeding each other in time, we mean that the feelings they produce by their motion and change succeed each other. As to the objects themselves—all we attribute to them is permanence in space and motion or sequence. To space and force we assign an independent reality inherent in the things themselves: but when we speak of duration and succession in time of external objects, we pass out of the region of object-attributes and connect these externalities directly with the perceiving subject.

§ 27. We are indeed enabled to say that material objects exist in time and that the world of matter has duration, but only with the inevitable explanation that the time does not belong to them but to the Ego which is posited as perceiving. All we can conclude is—not that time is an attribute of external objects, but that all cognition implies an Ego as contemplating and perceiving Non-Ego objects. So that we are brought around again to the first datum of philosophy, the antithesis and parallelism of Ego and Non-Ego. In the ultimate analysis this is the sure result.

§ 28. Hence we cannot merge time-relations into space-relations. Time is not space; for our knowledge of space is attained through resistance, and our entire experience of space is of that which affords room for movement of resisting bodies. It will hardly be contended that the mind affords room for the movement of material things, for that would be to identify mind and matter at once: but it will not be forgotten that mental experiences do give the complete notion of time. Therefore, unless there are two different kinds of time, objective time and subjective time, we cannot attribute time to material objects. Mr. Shadworth H. Hodgson[1]

[1] *Time and Space*, Part I. Chap. II. Sec. 11.

granted that they exist in space because they *do* so exist and because such their existence is a matter of direct perception which can neither be explained in words nor contravened in imagination; because in short space is a reality.'

TIME.

§ 25. There is no sensation of duration; but sensations endure: there is no sensation of successions in time, but sensations succeed in a series. If there were no permanent space, so far as experience teaches us, there would be no experience of duration; and if there were no motion there would be no succession in time; but duration is not space and succession in time is not motion. Time relations are not relations of material objects with each other but relations of mental phenomena with reference to each other and with reference to material objects. Professor Bain [1] divides knowledge into two portions, one—'the Object World, the Extended World, and less correctly Matter and the External World;' the other 'the Subject World, the Unextended Mind, and less properly the Internal World.' Among the attributes common to these two worlds he places succession and duration. 'Duration and Succession (with number),' he says, 'belong alike to states of the object and states of the subject. The element of Time, which is duration and succession generalised to the utmost and reduced to a common measure, is a property of both worlds; a circumstance that has been noticed from the very beginning of philosophy.' From this view I have already expressed my dissent, as it seems to me misleading and certain to entail confusion in both somatology and psychology. It tends toward the affirmation of an identity between the Ego and the Non-Ego, which is contradicted by the first postulate of science. There is no doubt that time in its two modes is a constituent element of all states of consciousness; this is universally conceded. All feelings, thoughts, and volitions have duration and succession. It will also be conceded that motion of resisting bodies is a phenomenon which is external to the mind and appertains to the Non-Ego world; also that resistance itself is such a phenomenon. Now if we have given sensational experiences of motion and resistance, the mental appreciation of those experiences, either as of the mental side of the presentative phenomena or as of the phenomena represented, gives the whole experience from which we derive the notion Time. And no

[1] *Logic*, Deduction. Appendix C

attribution of duration or succession to external phenomena supersedes or does away with the notions of resistance and extension, permanence in space and sequence of forces. Thus it appears that the relations of bodies with each other, as apprehended by the mind, are not at all relations of time but relations of extension and co-existence.

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[1] *Time and Space*, Part I. Chap. II. Sec. 11.

has clearly shown that objective time so-called is only representation from various presentative experiences which do not include time at all save whatever time is involved in all perception, that is subjective time. There is no advantage in attributing time to external objects, for all that the idea of time can give is furnished by extension—an attribute admittedly belonging to matter.

§ 29. True, time as a notion of the mind is objective, in the sense that every idea is objective; that is, the mind objectifies all its states and acts and holds them up for examination, analysis, synthesis, comparison and various other purposes: but all the while it posits these objects as different from external or material objects. It never identifies the idea of a house with a house itself or the representation of a train of movements with those movements actually occurring (unless it may be in hallucinations and illusions). To all these representations time belongs as a part of the mental experience; but it has no relevancy whatever to the material phenomena as an attribute of the material substance. Our analysis heretofore made [1] reveals the consciousness of duration and succession to exist as an element of every act of cognition, without which there is no knowledge. If duration and succession are attributes of material objects we might as plausibly argue that any other element of cognition belongs to matter—indeed that intelligence itself is a function of the material world.

§ 30. I do not propose to introduce here a very thorough discussion of the meaning and relations of time; what is now said has been expressed chiefly for the purpose of making more clear the position and nature of space. All that we need to do at present is to exclude time from the material conditions of states of consciousness. The full consideration of the subject in all its breadth belongs rather to philosophy than to psychology.

§ 31. Duration and succession then are mental and not material attributes. Duration corresponds to permanence of space and succession to motion in space. Having given force and space and a motion in space of resisting bodies, endowed with presentativity; then a representation of these presentative phenomena will give us at once duration and succession. As has been already shown they are involved in the very act of perception and are a necessary part of it.[1] But sequence of material objects is one thing; permanence of space is one thing; duration of the experience is another, and succession of experiences is another; the first couple are attri-

[1] Chap. IX.

butes of matter, the last couple are attributes of mind ; and the two pairs are radically distinct and mutually exclusive, though mutually postulating and implying each other. It is the old contradiction and yet mutual interdependence of Ego and Non-Ego, which it is the business of psychology at any rate to state correctly even if it cannot explain.

§ 32. In conclusion we may say, therefore, that time is an abstract whose concretes are something enduring in mind and something succeeding something in mind. It corresponds to extension in the material world; its factor duration corresponds to space-permanence, its factor succession to motion in space. Confusion is very apt to result from the necessity existing of expressing time-relations in terms of motion and space and also from the application of time to the measurement and determination for the perceiving subject of space and force and their relations: but for scientific purposes entanglement can be avoided and only avoided by keeping constantly in view the fundamental antithesis of Ego and Non-Ego and the fact that time belongs to the Ego and is not an attribute or quality of Non-Ego objects.

CHAPTER XIX.

INORGANIC AND ORGANIC NATURE.[1]

§ 1. THE law of evolution (Chap. XVII. § 20) expresses the fact that there is in nature a course of integration of forces from indefiniteness, simplicity, and homogeneity in their relations to definiteness, complexity and heterogeneity. We find, therefore, existing in nature various degrees of complexity and heterogeneity which are affected and changed by the actions and reactions of different forces. On the dynamical side we have progressive build-

[1] The biological facts in this and the following chapters have been stated after the examination and comparison of a great number of authorities. I have frequently condensed and sometimes used exactly the language of that author who seemed to me to state most concisely and clearly the truth I have needed for the purposes of this work. Where any long passage from any author is used, it is always indicated by quotation marks, and whenever I have condensed or altered phraseology and then made use of it a foot reference will enable the reader to refer to the author whose work I had before me in writing the exposition; but I have not thought it necessary to refer to the very many works consulted for verification.

ing up and on the statical side aggregates or integers as the result of such up-building. Homogeneity is unstable and inevitably lapses into heterogeneity; the action of forces upon each other necessarily produces a multiplication of effects and thus a greater complexity; and with the greater heterogeneity and complexity goes a segregation of like effects, creating an increase also in definiteness.

§ 2. Out of the general mass of matter composing the universe there appears a large class of specialised forms of static and dynamic forces in combination, each one of which forms is a totality whose parts are mutually interdependent and subservient to the integrity and growth of the whole. These forms together constitute what is termed Organic Nature, and in contradistinction all other forms of matter and forces in combination in the aggregate constitute Inorganic or Anorganic Nature. The constituents of the former grand division are Organisms; of the latter Anorganisms.

§ 3. An Organism is a specialised material integer, with a structure of co-ordinated parts containing within itself centres of dynamic forces whose natural operation works out a complete course first of evolution and integration of the integer and then of its dissolution and disintegration; and in the process forms within the structure centres of forces capable of reproducing the organism in other similar individuals.

§ 4. The Anorganism is a material integer, the natural operation of whose dynamic forces works out proximately the disintegration and dissolution of the integer and has no power of reproduction.

§ 5. *Life is the evolution and integration of an organism.* Death is the dissolution and disintegration of an organism. An organism is said to be *living* while the processes of evolution and integration of the organism as a whole are going on: an organism is said to be *dead* when such processes of evolution and integration have ceased and there remain only in operation processes of dissolution and disintegration.

§ 6. Organisms call attention primarily to structure, life to function. The structure of organisms does not embrace constituent elements which are different in kind from the elements of anorganisms. The differences are differences of collocation and combination. The structure of organisms is one peculiarly and specially adapted to the operation of molecular forces. Organisms are to be regarded as specialisations from the general mass of inorganic matter. The chief constituents of organisms are, Carbon, Hydrogen, Oxygen, and Nitrogen or Azote. To these may be added

in lesser and varying proportions, Phosphorus, Calcium, Sulphur, Chlorine, Fluorine, Sodium, Potassium, Iron, Magnesium, and Silicon. All of these elements are found in different anorganisms.

§ 7. But though these elements are not peculiar to the organic world, they are to be observed even in the inorganic sphere as peculiarly suited to the composition of integers within which can proceed a special course of evolution like that which we characterise as life. Three of these elements have ultimate units of extreme mobility. Oxygen, hydrogen, and nitrogen exist in nature only in a gaseous state, thus favouring mobility. At the same time while physical mobility of the molecules is favoured, chemical stability in the atoms is secured by the great chemical inertia of hydrogen, carbon, and, most of all, nitrogen. Remarkable chemical inertia and remarkable physical instability are leading characteristics of these elements which form the structure of living bodies. On the other hand, the remaining one after the three chief elements just considered have been taken out, namely oxygen, exhibits a wide range and great intensity of chemical affinities, thus favouring some degree of chemical modification in the evolution of the structure. Again, atomic cohesion is secured by the presence of carbon, the most cohesive of all the elements. It is true that binary compounds of these four chief elements which enter into the composition of organisms have a molecular mobility much less than that of the elements themselves, but nevertheless it is greater than that of binary compounds in general; and it is still the case that instability and inertness are leading characters of the elements of organic bodies, balanced however by the stability of carbon and the activity of oxygen.

§ 8. It should be further noted that allotropism and isomerism are common properties of the elements of organic bodies. Oxygen and ozone, carbon in the forms of diamond, graphite, and charcoal furnish the most salient instances. Among the hydro-carbons, no less than sixteen to twenty of the essential oils are isomeric with essential oil of turpentine. The importance of this fact in the study of organisms of course lies in the evidence it gives of a facility in their elemental structure for allowing organic evolution.

§ 9. Organic substances are mostly combinations of higher multiples of the elements. A single atom of organic matter contains perhaps hundreds of simple chemical atoms. The atom of albumen is variously stated to be made up of from four hundred and eighty to eight hundred and eighty atoms, chiefly of the

four primary organic elements. Organic bodies are highly complex compounds.

Chemically considered, organisms are made up of material substances compounded of the elements before given and which substances are divisible into three classes:

1. Crystallisable or volatile bodies without decomposition having a mineral origin and coming forth from the organism as they enter it (water, certain salts and so on);

2. Crystallisable or volatile bodies without decomposition which are found in the organism itself and come forth from it directly as excrementitial bodies. They are acids, for instance, as tartaric, lactic, uric, citric; vegetal and animal alkaloids; creatine, creatinin, urea, caffeine, etc.; fat or resinous bodies; sugars of the liver, of grape, of milk, of cane, and the like.

3. Bodies not crystallisable or coagulable formed in the organism itself, then decomposed there and giving birth to bodies of the second class. These bodies of the third class constitute the most important part of the body of organised beings (as globuline, musculine, fibrine, albumine, caseine, cellulose, starch, dextrine, gum and some colouring matters).[1]

§ 10. Every organism is a compound of colloidal bodies containing in solution or otherwise crystallisable bodies. The crystalloids comprehend all the bodies which ordinarily form solutions sapid and free from viscosity and which have also the property of traversing by diffusion porous partitions. Colloids are more or less jelly-like and diffuse themselves feebly and slowly. The diffusibility of crystalloids is so great that they can penetrate the colloids, blend with them as intensely as with water, while the colloids have scarcely ability to diffuse themselves sufficiently to effect any union with each other. Colloids are chemically inert, but from their softness and fluidity are capable of receiving and allowing penetration and diffusion of external agents. On the other hand, crystalloids are possessed of great diffusive power. For instance hydro-chloric acid,—a crystalloid, being nearly a hundred times more diffusible than caramel—a colloid, and fifty times more than albumen—also a colloid.

§ 11. Moreover, this great difference between the diffusibility of colloids and that of crystalloids causes the result that when we separate by a permeable septum water and a colloid holding in solution a crystalloid, the latter passes from the colloid through

[1] Letourneau's *Biology*.

the partition to the water. Hence where this condition of things exists motion is generated and change must follow.

§ 12. From the foregoing facts as well as others supplementing them, all of which are found in great amplitude of detail and thoroughness of exposition in the leading biological treatises,[1] it appears that having given a structure containing a large mass of colloids holding within them crystalloids, we have both a mechanical fixity which ensures the stability of the whole and also a molecular mobility which admits of an easy and continuous rejection of bodies already in the structure and the ready assumption of new material from without, thus making possible a growth or building up of the structure from the relatively simple, indefinite and homogeneous to the relatively complex, definite and heterogeneous, at the same time preserving through all the integrity of the structure itself.

§ 13. Primary organic substances exist in two forms, the first that of a microscopic colloidal contractile mass called *sarcode* or *cytode*. Of this description are Monads, Protamœbæ and Polythalamia. The second form is that of living liquids called *blastemas*, which when existing in systems of canals and serving as the receptacles of disassimilated products and as the reservoirs of products for assimilation are termed *plasmas* or plasmatic liquids. These blastematic liquids contain also the organic elements of the first form. Such histological organic elements are commonly said to be structureless. Their characteristic is extreme modifiability and indefiniteness of form, and their vitality is exhibited in the performance of certain characteristically vital functions of which we have presently to speak. Notwithstanding the absence of definite structure, they have an integrity of their own and that integrity is susceptible of and subject to organic evolution.

§ 14. The next noticeable form of organic structure, and that which in the opinion of most biologists constitutes the primary morphological unit, is the *cell*, which is a microscopical corpuscle, more or less spherical, of colloidal consistency and containing within it a nucleated centre of functional activity. The outer surface of the cell frequently is hard, and this hardened surface is termed the cellular membrane. Among the simplest and earliest in order of organised beings we find those composed either of a single cell or a few similar and juxtaposed cells; and in examining

[1] See Spencer's *Biology*, Part I. Chap. I.; Letourneau's *Biology*, Bk. I. Chap. II.; Lewes' *Physical Basis of Mind*, Problem I.

the structure of higher organisations we encounter in the ultimate histological analysis either cells or manifest differentiations from original cellular structure; while the embryological development of the most complex living beings is a course of evolution from a one-celled structure, through the polycellular, to their highly differentiated natal organisation.

§ 15. Another primary histological element is the *fibre*, which is a microscopical element, formed sometimes from cells by the prolongation of processes uniting two or more of them and sometimes directly from blastemas, though this last statement is the subject of contest by those who maintain the 'cell-theory' to the exclusion of every other doctrine of primitive types. Fibres are elongated and linear as contradistinguished from cells, whose form is spherical.[1]

§ 16. Living beings then are aggregations of and integrated differentiations from these primitive structural elements. Further examination of structures would lead us at once to the distinctions between animals and plants, consideration of which we reserve for the next chapter.

§ 17. Organisms exhibit several distinctive varieties of functional force, which are generally embraced under the heads of *Nutrition*, *Growth*, *Reproduction*, *Motility*, *Innervation* and perhaps one or two others, of which the first three are fundamental and common to all life. An examination of our definition of an organism discloses three classes of operations of the forces contained within the structure which are indicated by the terms (1) Evolution and Integration, (2) Dissolution and Disintegration, (3) Reproduction. All vital processes can be referred to one of these three general classes. *Nutrition* and *Growth* do not express anything more than *Evolution* and *Integration*, for these latter names imply preservation of the structure and increase, while the former mean nothing in addition. If it appear that the operation of life-forces tends to accomplish evolution and integration, dissolution and disintegration, and also reproduction, the next question is how are these results worked out? What specifically are the processes which characterise organic evolution and enable us to distinguish it from inorganic evolution? Crystals grow; so do islands and deltas; is their growth the same growth as that of plants and animals?

§ 18. Probably the most distinctive character of organic func-

[1] Letourneau's *Biology*.

tions is reproduction. Integers of the inorganic world cannot in any sense be said to reproduce themselves. We can have no hesitation then in adopting the term *Reproduction* to indicate one essential class of vital functions.

§ 19. In the organism integrity is preserved and yet the structure is developed, augmented, and integrated. This takes place by a continuous process of change—the introduction of new material from without into the organism, certain changes occurring therein and the expulsion from the organism of matter already contained or introduced within. Disintegration and dissolution of course postulate a preponderance of expulsive or repellent forces. The first set of functions then which will attract the notice of the scientific observer is in connection with the introduction of extrinsic forces within the organism, so as to place the appropriate external matter into the closest contiguity with the internal. Before any transformation takes place nutriment must be brought into a contiguous position to the organic material. A large group of organic functions then may be regarded as processes of *Introsusception.*[1]

§ 20. Inasmuch as not all extrinsic substances are of avail for the purposes of organic evolution, a selective process takes place by which some are introduced within the organism and some are repelled from it, though brought into contact with or near proximity to the organic integer. Another class then of organic functions is expressed by the term *Repulsion.*

§ 21. When external substances are once introduced within the organic structure, that portion of them of which use can be made for nutriment and growth is incorporated into and made to form an integral part of the structure by processes of *Assimilation,* whereby the foreign material is transformed into the same kind of matter of which the organism is composed. Growth by assimilation and reproduction are the two most significant and characteristic marks of vitality.

§ 22. The processes which we have thus far noted are subservient chiefly to evolution and integration. The remaining organic functions have their chief office to promote disintegration and dissolution. The first of these is *Disassimilation,* which is the reverse of assimilation. That new substances may become incorporated with the organism, a place must be made for them

[1] I have ventured to revive an obsolete word because it seems to me so eminently appropriate and useful in this connection.

by the giving way of the old. Incessant waste and repair attend vital action. Portions of the organism become unlike the structural matter and then are in a condition to become dissevered from the structure itself.

§ 23. This disseverance is effected by processes of *Expulsion*. Disassimilated matter is carried out of the organism by a variety of movements, whose general characters we shall notice at a later stage.

§ 24. We have then, when tabulated, the following view of organic functions:—

Functions of Evolution and Integration:	*Functions of Dissolution and Disintegration:*
Introsusception.	Disassimilation.
Repulsion.	Expulsion.
Assimilation.	

Functions of Reproduction.

Functions of reproduction may be classed with those of evolution and integration, but the former apply chiefly to race evolution rather than to individual evolution and hence should constitute a separate division, though reproduction is really only an extension of nutrition and growth. Besides, the exercise of reproductive functions has an important and frequently the most powerful influence in accomplishing or hastening the dissolution and disintegration of the individual organism.

§ 25. These various functions are not to be marked off by any definite lines. There is not a point at which we can say decidedly that introsusception has ended and assimilation has superseded it. Assimilation frequently begins at the periphery and continues concomitantly with introsusception. The morsel of food is carried into the mouth and through the digestive tract; the useful matter is taken up into the structure and the waste is expelled. Introsusception, assimilation and expulsion are going on together: at the same time we can single out and separate the processes of digestive motion and tell the variety of vital function to which they belong. Sometimes the same process serves more than one function. Respiration is both introsusceptive and assimilative; it is also expulsive. Deglutition is both introsusceptive and assimilative. Absorption is the same. Secretion is both assimilative and expulsive. Sphincter action effects both repulsion and

expulsion. Functions shade into one another, but at the same time their prevailing offices can usually be discerned and their proper place in a system of classification can be made evident.

§ 26. The above-mentioned functions of organic life make clear the necessity of considering the inorganic environments in the midst of which life can subsist and show the dependence of organisms upon those environments. The surrounding forces must supply the things needed for introsusception and assimilation, and as these change so the organism itself must change. The environments have been divided into two general classes—The External or Cosmic Medium and the Internal or Physiological Medium. The former includes the external conditions of life and all outside circumstances which are capable of affecting the existence of the organism; the latter embraces the plasmas, the internal temperature and electrical conditions, together with such confined aërian or gaseous elements as may be found within the organism. With few exceptions there is no direct nutrition; the materials which are taken within the organism in the process of assimilation pass through an intermediary stage in which the modifications made are such as to alter the character of the materials from what they were on entering the organism, but in which the changes have not gone far enough to effect a complete assimilation or a complete separation of assimilable from disassimilable matter. Moreover, there are found within the internal medium elements of the structure from which proximately it is built up. In other words, matter is organised within the internal medium and as organised is added to the structure. This organised portion of the internal medium has been termed *plasmode*, as being matter on its way to form a part of the structure.[1]

§ 27. Of course whatever changes occur in the external medium which do not affect the internal, as a rule do not affect the organism; and in like manner whatever external does affect the organism affects also and first the internal medium: so that the course of life is a series of changes within corresponding to changes without. It must also be observed that the organism itself in all its parts has a reactive influence upon its environments. It contains centres of out-going forces and has within itself balanced and unbalanced resistances creating motion and hence force which is constantly expending itself upon the forces pressing in from the external medium. We are thus brought to a law of the process of life: the

[1] G. H. Lewes. See *Physical Basis of Mind*, Chap. III.

course of evolution within the organism embracing a series of definite heterogeneous changes both simultaneous and successive continuously adjusts itself to the co-existences and sequences of the environment. In other words the process of life is the continuous adjustment of inner to outer relations.[1] This is not a proper definition of life, for it neglects the structure in which and for which this movement exists, but is a true expression of the manner in which the vital evolution of an organism proceeds.

§ 28. The salient feature of this adjustment is assimilation. The outer is made like the inner and, from the outer, food for assimilation is continuously selected. The organism must be nourished by material which is either like itself or which can be made like itself. Corresponding with this process is a process of disassimilation which makes room for the reception of newly assimilated products. Subsidiary to both are introsusceptive, repulsive and expulsive functions by which is accomplished the selection of material which can be assimilated and the rejection of substances which cannot subserve that purpose. The term *adjustment* indicates all these processes and these together with reproduction embrace all the vital functions.

§ 29. From what has preceded it will appear that the conditions of life are an organism containing component structural parts which permit organic evolution and an environment out of which materials can be selected by the organism to renew and increase its structure and into which waste material can be poured. Sarcode, a jelly-like germinal matter and blastema a living liquid are the varieties of matter in which the phenomena of life seem to have their beginnings, while the cell and the fibre are the primordial forms of organic structure, aggregations, differentiations and their integrations of which are the constituents of all organisms. Having given a structure suitable for organic evolution, the conditions of life which depend upon the environment are first the presence of material like the material of the structure in a sufficient degree to admit of being assimilated to it, and secondly the presence of such dynamic forces as will impel or allow the operation of the functional evolutive forces of the organism. Heat and Light are the most prominent of these dynamic agencies, though all forms of motion have more or less effect upon organic life. It is then obvious that differences of structure will require differences in the environment, and on the other hand that the latter differences will

[1] Herbert Spencer's *Biology*, Part I.

create the former. And since the inorganic world exhibits countless varieties in the collocation and combination of material forces, a vast amount of variety may reasonably be expected in the organic sphere. That such is actually the case scarcely need be remarked. Before we can proceed much farther with our brief consideration of the organic conditions of states of consciousness, we must take note of the most important divisions which the forces of evolution make in that department of nature which is filled by life-structures.

§ 30. The general order of nature must be considered in a study of the phenomena of life, since that order involves the causes of the evolution of life. The evolution of inorganic matter develops the conditions of environment which admit of and sustain life as well as those which produce variations in organic existences. Unfavourable environments must result in extinguishing certain species and such circumstances may be found as to preclude the existence of any life whatever. Organic life is specialised from the midst of inorganic conditions and is a part of and dependent upon the general evolution of nature. While, therefore, we are accustomed to associate vital forces more particularly with molecular forces, and while the latter have the most direct and the closest relation to organic development, the molar forces of the universe ultimately prepare and maintain the conditions of organic existence. The molar forces are the large stones at the base of the pyramid, upon which all the others rest.

§ 31. The genesis of life is still enshrouded in mystery. We know that the seed and the germ contain the potentiality of an existence like that from which they were cast off; but as to the beginnings of species and especially as to the origin of life in general we have singularly little information. The law of evolution explains changes in species, but we are not able historically to trace those changes in as complete a manner as is requisite for science. But, given a primitive simple homogeneous organic matter and its development into the highest degrees of complexity, heterogeneity and definite integration follow from the general laws of evolution. Mr. Spencer has made a table[1] showing the course of organic evolution and exhibiting the influence of the respective factors, which is annexed to this chapter. However, when we have traced all existing species to elementary sarcodic or blastematic matter, we find an assimilative and reproductive force whose origin we are not able to explain. It is thought that organic life has

[1] *Biology*, Part III. Chap. XIII.

H. SPENCER'S TABLE.

- Astronomic changes, Geologic changes, Meteorologic changes, — Alter the incidence of inorganic forces
- Enemies, Competitors, Co-operators, Prey, — varying in number; Enemies, Competitors, Co-operators, Prey, — varying in kind — Alter the incidence of organic forces

On each species; affecting

- its individuals
  - immediately through their functions
    - which partially in the first generation, and completely in the course of generations, are directly equilibrated with the changed agencies.
    - which have their direct equilibration with the changed agencies aided by indirect equilibration, through the more frequent survival of those in which the direct equilibration is most rapid.
  - mediately, through the aggregate of individuals
    - positively—by aiding the multiplication of those whose moving equilibria happen to be most congruous with the changed agencies; thus in the course of generations indirectly equilibrating certain individuals with them.
    - negatively—by killing those whose moving equilibria are most incongruous with the changed agencies; thus in the course of generations indirectly equilibrating each of its surviving individuals with them.
- its aggregate of individuals
  - by acting on it in some parts of the habitat more than in others; and thus differentiating the species into local varieties.
  - by acting differently on slightly unlike individuals in the same locality;
    - and thus causing differentiations of the species into varieties, irrespective of locality.
    - and thus causing modification of the species as a whole, by abstracting a certain class of its units.

been produced from organic matter by human contrivance in what is termed spontaneous generation, but this, if accomplished at all, has not been done in a sufficient number of instances to make us quite sure what has been thereby added to science or whether anything has been added at all. The strong probabilities are that collocations and combinations of inorganic forces in qualities and quantities not yet fully known, by the natural laws of force and matter will produce and have been producing organising forces and organic matter and that from a multitude of such organic germs the world of organisms has sprung in all its diversities and complexities. Possibly it may appear that life is but an allotropic form which all force possesses and that all matter is entitled to be called organic, needing only favouring circumstances to make its organising properties evident. To these conclusions our present knowledge seems to point.

CHAPTER XX.

VEGETAL AND ANIMAL LIFE.

§ 1. THERE is one division of organisms which takes precedence of all others and separates the domain of organic nature into two grand kingdoms, which, though having many common characters, are so distinct in the main as to impress both the scientific and the empirical observer. These two grand divisions are *Plants* and *Animals.*

§ 2. Probably the most clearly distinctive mark of animals as related to plants is the superior self-mobility of the former. As a general truth it may be stated that plants have no self-mobility either of the individual as a whole or of the parts with reference to each other, while animals have both. This statement is only true generally speaking, for in the border land between animals and plants, and in the lower orders of both, instances are not wanting of animals which, as barnacles, are not self-mobile, and of plants, as some aquatic tribes, which are freely locomotive. So also many plants exhibit motion of their parts with respect to each other, as in the case of the mimosa and the Venus's fly-trap. Again, all plants have the motions incident to nutrition and growth. But aside from these facts the chief idea of animal life as distinguished from plant life is self-mobility.

§ 3. The second line of differences exists in the respective methods of introsusception and repulsion. The manner of introsusception characteristic of the plant is absorption; that of the animal, prehension and introduction into an internal cavity from which the nutriment is assimilated. With the animal, introsusception takes place also by absorption and it is only over and above this that the prehensive activities come into play; but the plant has not the latter, except in some rare or anomalous instances. The plant obtains its nutriment by absorption, the animal by absorption *and* prehension. In reality, the self-mobility of the animal is chiefly subsidiary to the selective functions implied in prehension. By locomotion the creature is able to seize the prey which is suited to its wants and also to reject and escape from what is injurious. We may, therefore, properly connect the facts of this and the preceding section and assert that the principal differences between the two grand kingdoms of vital manifestations lie in their respective methods of introsusception and repulsion.

§ 4. Introsusception is a process of accumulating force within the individual.[1] Assimilation is a process of transferring force. This is accomplished through a permeation of the organism by the introduced substances, in the course of which the latter are continually modified mechanically and chemically and continually in the progress like matter in the introduced substance is added to like matter in the structure. Correspondingly, the process of disassimilation goes on, in which the material of the structure is thrown down and then carried out into the environment. These two sets of processes create a circulation within the organism which is really nothing but a continual flowing in and flowing out of currents of incremental and excremental matter. Between animals and plants these courses of assimilation and disassimilation are essentially the same. But there is a radical and important difference in the assimilable matter constituting the media of nutrition and growth. Plants are nourished principally by inorganic matter; animals principally by organic substances. The mineral world for the most part furnishes food for plants, the vegetal and animal world food for animals.[2] This constitutes the third great distinction between the two grand divisions we are now considering.

[1] See Spencer's *Principles of Biology*, Part II, Chap. XI.

[2] This statement cannot be made absolutely, but must be taken as only generally true. Observations made upon insectivorous plants show that they *really feed on* organic matter; on the other hand, mineral substances, as water,

§ 5. The processes of expulsion in plants and animals differ in a degree corresponding to their differences of introsusception. As in plants absorption all along the surface of the individual is the normal method of introsusception, so exhalation is the usual manner of rejection. On the other hand in the case of animals, in addition to exhalation from the surface, there are arranged courses of prehensive excretion by which the disassimilated or non-assimilable substances are carried along and pushed out of the system. Exhalation and excretion, then, mark the animal kingdom.

§ 6. Reproduction is not essentially different in animals from the same function in plant life. As before remarked, the processes of generation are only extensions of those of nutrition and growth. 'Growth and generation have for cause a superabundance of nutritive materials. This superabundance has for effect first of all to carry the anatomical elements to their maximum volume, then to provoke the formation of new elements. As long as the individual has not attained all the development compatible with the plan of his being, the elements, newly born, remain aggregated to the pre-existent elements. When the limit of growth is

are necessary to animal life Whether they can properly be called aliments or not is perhaps a question, but they are certainly beyond all cavil requisite for alimentation, and some of them are taken up into the tissues and cells. Professor Huxley in speaking of animals and plants says:—'The latter [plants] have no power of locomotion and only rarely exhibit any distinct movement of their parts when these are irritated mechanically, or otherwise. They are devoid of any digestive cavity; and the matters which serve as their nutriment are absorbed in the gaseous and fluid state. Ordinary animals, on the contrary, not only possess conspicuous locomotive activity, but their parts readily alter their form or position when irritated Their nutriment, consisting of other animals or of plants, is taken in the solid form into a digestive cavity.' But, 'traced down to their lowest terms, the series of plant forms gradually lose more and more of their distinctive vegetable features, while the series of animal forms part with more and more of their distinctive animal characters and the two series converge to a common term. The most characteristic morphological peculiarity of the plant is the investment of each of its component cells by a sac, the walls of which contain cellulose, or some closely analogous compound; and the most characteristic physiological peculiarity of the plant is its power of manufacturing protein from chemical compounds of a less complex nature. The most characteristic morphological peculiarity of the animal is the absence of any such cellulose investment. The most characteristic physiological peculiarity of the animal is its want of power to manufacture protein out of simpler compounds. The great majority of living things are at once referable to one of the two categories thus defined, but there are some in which the presence of one or other characteristic mark cannot be ascertained, and others which appear at different periods of their existence to belong to different categories.'—*Anatomy of Invertebrated Animals*, Chap. I.

attained, when there is no longer room in the organised individual for a new adjunction of histological elements, the new comers detach themselves from their organic stem and constitute independent individuals which evolve in their turn.'[1]

§ 7. The foregoing sections have indicated the most general differences between vegetal and animal life. Corresponding to these there must be differences of structure, for of course each organism must have organs fitted for its own functional processes; and in the particulars in which there is a similarity of function we should expect and shall find similarities of structure, more or less apparent. There will be sets of organs which naturally will be grouped together according as they subserve like functions. We shall see, therefore, that plants have for offices of Introsusception an Absorptive System; for purposes of Expulsion an Exhalatory System; for functions of Assimilation and Disassimilation a Circulatory System; and for the objects of Reproduction, a Reproductive System. After their own fashion animals have for functions of Introsusception and Repulsion a Motor System and an Absorptive System; for Expulsion functions an Exhalatory and an Excretory System; for offices of Assimilation and Disassimilation, a Digestive-Circulatory System; and for Reproductive purposes, a Reproductive System.

§ 8. As to structure generally it is to be noted that the number and complexity of organs is much greater among animals than among plants. The animal kingdom displays higher grades of evolution than does the vegetal. Animals exhibit over plants an increase of heterogeneity, definiteness and complexity. This constitutes the last leading distinction between plants and animals which we shall be called upon to notice; others, as those of chemical composition and temperature, are incident to what has been already stated.

§ 9. The results of this chapter thus far obtained may be shown in the following scheme, which exhibits the analogies and differences between animals and plants both as regards structure and function. It makes clearer to the reader's mind the truth of the remarks contained in the last section. And if the comparison were carried out into details, the relative simplicity of plant and complexity of animal structures and functions would be still more evident. On the other hand, we are impressed also with the unity of all life. The similarities between the animal and the vegetal systems are numerous and obvious.

[1] Letourneau's *Biology*, Bk. IV. Chap. II.

PLANTS.

Structure.	*Function.*
More simple, indefinite and homogeneous.	
Absorptive System .	Introsusception Repulsion
Exhalatory System .	Expulsion
Circulatory System .	Assimilation Disassimilation
Reproductive System	Reproduction

ANIMALS.

Structure.	*Function.*
More complex, definite and heterogeneous.	
Absorptive System Motor System	Introsusception Absorption Prehension Repulsion
Exhalatory System Excretory System	Expulsion Exhalation Excretion
Digestive-Circulatory System	Assimilation Disassimilation
Reproductive System	Reproduction

§ 10. As we approach the lower forms of life the differences between animals and plants disappear to such a degree as to make it doubtful oftentimes, when the primary forms are reached, whether the individual is vegetal or animal. But there always seems to be an original difference between the plant cell and the animal cell, and we have no evidence of a descent of an animal form from a plant germ or the converse. We can trace the two back to sarcodic or blastematic matter, but after the beginning of a plant evolution is distinctly marked, we are not able to find any evidences of development into animal evolution either by growth or reproduction.

§ 11. The existence of a class of organisms which are so doubtful in their characters as to make it uncertain whether they should be identified with plant life or animal life, has led to placing them in a class apart called Protista, which includes such creatures as the Monera, Amœboidea, Flagellata, Diatomeæ and Rhizopoda, and possibly the Fungi, though these last are generally regarded as vegetals. With these inferior organisms, many of them being, as they have been aptly termed, 'organisms without organs,' we shall not concern ourselves any further, as the necessities of this work do not require more than a very general statement of biological truths. It should be remarked, however, that along these lower confines of organic life our knowledge is exceedingly limited and hence there is afforded in this region a wide field for future scientific investigation.[1]

[1] Lewes's *Physical Basis of Mind*, Chap. V.; Letourneau's *Biology*, Part I. Chap. V.; Haeckel's *History of Creation*, Chap. XVI.

VEGETAL STRUCTURES IN GENERAL.

§ 12. Every complete anatomical vegetal element is a cell formed of a double wall, of a content, and of one or more nuclei. The external cellular development is constituted chemically of a ternary substance united to certain salts; this is the *Cellulose*, composed of carbon, hydrogen, and oxygen, and expressed $C^{12}H^{10}O^{10}$. When the histological element is complete, this external membrane is lined with another very thin vesicle, which contains azote and is albuminoidal. This azotised membrane englobes a semi-liquid substance and one or two small spherical or ovoidal bodies, likewise azotised. These are the nuclei, in which are often included one or two nucleoles. The contents of the vegetal cells are both liquid and solid. The liquid is of oil or of water holding in suspension either molecular azotised granulations, or particles of fecula, or drops of oil or of resin, or small green bodies called chlorophyllian bodies, to which last corpuscles plants owe their green colour. The non-oleose liquid contents are generally called protoplasm by botanists. The internal vesicles, the protoplasm, and the nuclei form an albuminoidal whole.[1]

§ 13. Cells in form are spheroidal, ovoidal, fibroidal, stellated or cylindroidal. They are juxtaposed, cemented together, and thus fused by re-absorption at the points of communication so as to open canals and to form tissues. The types of cells are the *simple cells*, as above described; the *filamentous cells*, all more or less cylindrical and eight or ten times longer than they are broad; *fibrous cells*, which juxtaposed lineally form the ligneous fibres of wood; *vascular cells*, which by their linear juxtaposition and the partial reabsorption of their walls constitute canalicules —vessels.[2]

§ 14. The vegetal structure in its earliest stage is a seed, which consists essentially of two parts, the *Radicle* and the *Plumule*. The Radicle grows downward, penetrating the earth and moving away from the light, and forms the *root* or *descending axis*. The Plumule grows in the opposite direction, ascending into the air, moving toward the light and forms the *stem* or *ascending axis*. At first the ascending axis is a *bud* merely, a growing point, clothed and protected by little scales, the rudimentary *leaves*; as the growing point advances its lower scales

[1] Letourneau's *Biology*. [2] Ibid. Bk. I. Chap. V.

gradually expand into leaves and new scales successively appear above, the axis being thus always terminated by a bud. Besides the terminal bud there are also formed buds in the axils of the leaves, one in each, some of which grow and develop off-shooting stems which constitute *branches* and which may themselves generate their own buds and branches and so on indefinitely. This is the general form of the structural growth. In addition we have the development of some of the buds into *flowers*, which contain the organs of reproduction, producing again the embryo or seed.

§ 15. There are four principal modes of structure found in the vegetal kingdom; they are :—

Exogens; Outside Growers,
Endogens; Inside Growers,
Acrogens; Point Growers,
Thallogens; Mass Growers.[1]

Exogens.—A cross-section of the stem or of a branch of an exogenous plant exhibits zones of different structures, which are distinguished as pith, medullary sheath, wood, and bark. The *pith* occupies the central part of the stem; it consists of cellular tissue, is chiefly abundant in herbaceous plants and all young stems. When new it is filled with fluids for the nourishment of the buds; as the plant grows older the pith loses its vitality, is filled with air only, is often torn into irregular cavities or disappears. The *medullary sheath* immediately surrounds the pith. It is a thin delicate tissue consisting of spiral vessels It communicates with every bud and sends off detachments of its vessels to the petioles and veins of every leaf. Its tubes secrete oxygen from carbonic acid or water, and convey it to the leaves. The *wood* consists of fibrous tissue, composed of elongated cells cohering by their sides in such a way that end overreaches end, forming a continuous fibre. With these are ducts and these with the tissues are arranged more or less distinctly in concentric zones or layers. The first or inner layer together with the medullary sheath and pith is the product of the first year. One new layer is formed each successive year of the plant's life. The wood is of two kinds, the *alburnum* or sap-

[1] I have not included in this classification the groups Dictyogens and Gymnogens. The former are monocotyledons with reticulated leaves and roots resembling the exogenous structure; they really belong, however, with the Endogens, the wood of the stem being youngest at the centre. The Gymnogens are Exogens with naked seeds.

wood, of light colour and soft structure, through which mainly the sap ascends; and the *duramen* or hard wood, which, so far as vegetation is concerned, is dead. The *bark* is a covering which protects the wood. Its substance is cellular tissue arranged in layers. It is capable of expansion by lateral growth to any extent. When the bark does not appear, there is a superficial membrane of united empty cells mostly tabular, which is called the *epidermis*.

Endogens.—In the cross-section of an endogenous stem there is no visible distinction of bark, wood, pith, or of annual layers of any kind. The plant is composed of tissues similar to those of the exogenous stem, but differently arranged. The body of the endogen consists of cellular tissue within which numerous thread-like bundles of woody matter are imbedded, which consist each of one or more dotted ducts accompanied by spiral vessels, fibrous tissue and cells for secretions. The growth of these stems takes place by the addition of new wood bundles to the interior of the stem.

Acrogens.—The cross-section of an acrogenous stem shows a body of cellular tissue strengthened by an outer zone of fibro-vascular bundles, the whole inclosed with a sort of bark. The stems however grow only at the end. Mosses and ferns are examples.

Thallogens.—These are the lowest order of vegetal life. They have no true axis and no other than simple cellular tissue (parenchyma), which grows in threads or in mass in all directions. The apparent stems relate only to the fructification. Sea-weeds and lichens are examples.

§ 16. The leaf may be regarded as an expansion of the two outer integuments of the bark, or of the green or middle bark and the epidermis, expanded into a broad thin surface by a woody framework proceeding from the medullary sheath and the liber or inner bark. The framework of veins in the leaf is fibro-vascular, abounding in spiral vessels and strengthened with liber. The substance of the leaf is cellular tissue (parenchyma), in the vesicles of which are small aggregations of chlorophyll which gives the green colour to the leaves. The first leaves which spring from the plumule are called seed leaves or cotyledons. Endogens have a single cotyledon only: exogens two or more.[1]

§ 17. The general structure then of plants is that of a cellular, fibrous and vascular stem, fixed in the ground by a root growing downward, and supporting upward differentiations in the form of

[1] The foregoing three sections are condensed chiefly from Wood's *Botany*, N. Y., 1868.

branches and leaves and culminating in reproductive organs and products, called flower and fruit. Further details of structure we will examine in connection with function.

THE ABSORPTIVE SYSTEM IN PLANTS.

§ 18. Introsusception in plants is effected by continual absorption. The absorption of liquids holding in solution the food of the plant is accomplished actively through the root. The delicate cells of the extremities of the rootlets are the principal agents, other portions of the root being covered with an epidermis relatively impervious. The process is capillary attraction and endosmosis. The water in the earth moistens the extremities of the roots and is then and thus taken up into the circulatory system of the plant, together with ammoniac salts, phosphates, salts of potash, etc. Moreover the cells of the root absorb oxygen which diffuses itself through them from the air which permeates the earth surrounding them. Absorption also takes place to some extent through the stem. The epidermis never entirely cuts off the underlying tissues from the open air. It is full of little clefts or mouths called *stomata*, which communicate with the intercellular passages. The number of them is enormous, particularly on the leaves. On the stem, even when the epidermis is replaced by bark, there is some absorption of air. But the chief aerian absorption is by the leaves, through whose surface the air and watery vapour penetrate. Where there are stomata these elements enter through them, and where there are none there is a direct action upon the cells. In aquatic plants, water penetrates through the stomata or acts directly upon the cells. Another and peculiar office of introsusception is accomplished by the chlorophyll of the leaves. This last substance under the influence of light decomposes the carbonic acid of the air and absorbs carbon, a supremely important element in the food of plants.

§ 19. Repulsion is effected in plants by the epidermis and the bark, which are sufficiently durable and impervious to destructive influences to preserve under ordinary circumstances the integrity of the plant, both by resisting impinging substances and by preventing evaporation from within. The solidity and coherence of the structure itself is its further protection. In addition, there are some special arrangements looking to the same end, which are deserving of notice. In the first place the roots have to a degree

a selective power, which has not been fully explained, of absorbing some substances and rejecting others. If wheat be grown in the same soil with the pea, the former will select and absorb the silica along with the water and will repel the lime; the pea selects the lime in preference to the silica.[1] Buckwheat will take chiefly magnesia; cabbage and beans, potash. Secondly, along the stems and leaves the stomata are furnished with cells which open in a moist atmosphere and close in a dry. This facility checks evaporation, but it equally prevents the introduction of dry air. Thirdly, the leaves of plants of which the mimosa is a type have an irritability and contractility which manifests itself upon the near approach of a foreign substance. So also the shape of many leaves furnishes a protection against evaporation, as in the case of the pitcher plants whose cup is furnished with a lid closing in dry weather. Fourthly, many plants are furnished with a most formidable arrangement of thorns and spines which constitute the most effectual means of self-defence. These are transformed leaves or abortive branches. Of the same character are prickles growing on the epidermis, which are simply of hardened cellular tissue. In the same connection, poisonous and acrid juices should be mentioned.

THE CIRCULATORY SYSTEM IN PLANTS.

§ 20. The liquids which are taken into the plant through the root, by capillarity and by osmosis move upward toward the leaves. The fluid thus moving, as has been before shown, consists largely of water and is called the *sap*—crude sap, in the form first assumed in its ascendant course. It contains in solution small quantities of gases and mineral salts imbibed by the roots, together with dextrine and sugar which it dissolves out of the cells on its way. The sap movement is accomplished through the central part or through the alburnum when its passage through the centre or duramen is prevented by the hardening of the cell walls from age.

§ 21. The sap gains in density in its course of ascension to the leaves. Having arrived there it undergoes a further and more important change. Under the influence of the sunshine, the chlorophyllian bodies decompose carbonic acid and retain the carbon giving off by exhalation the oxygen, so that the effect upon the sap is to concentrate it by eliminating the water and

[1] Wood's *Botany*.

increasing the carbon. It undergoes at the leaves its first marked assimilative motion. This is due not merely to the chlorophyll of the leaves but also to the action of incident forces, as the light and the air. In the whole course of assimilation the presence of oxygen derived by absorption from the air is a necessary element.

§ 22. When elaborated by the action of the forces encountered at the leaves the sap becomes of the nature of a blastema. It is in a condition to nourish and increase the structure. It is then driven by exosmotic impulsion, chiefly from the leaves back toward the roots. Its course lies principally through the tissues of the bark, and in its progress it continually makes deposits of nutritive matter which are thus added to the structure to repair waste and to cause growth.

§ 23. The process of assimilation is further aided by a circulatory movement carried on in each cell. Under certain conditions of heat there is to be observed a gyration of the protoplasm within the cell. This probably is a method of local nutrition for renewing the structure and removing effete matter.

The processes of disassimilation have no peculiar features, nor is there any special apparatus for disposing of disassimilated products. Disassimilation occurs in accordance with the general tendency in nature of the homogeneous to lapse into heterogeneity. This having been accomplished or begun, cohesion is noticed to have weakened and particles of matter by the action of internal forces are removed from their place in the structure. Some pass out directly by exhalation and others pass into the sap and are eliminated in its course; some are retained and by clogging the vital functions tend to complete its decay.

THE EXHALATORY SYSTEM IN PLANTS.

§ 24. As has been already remarked, the principal method of elimination in the vegetal kingdom is exhalation. A vast amount of water is exhaled by plants chiefly through the stomata. Room is thus afforded for the movement of introsusceptive fluids. Moreover in the leaves oxygen is exhaled under the chlorophyllian action. Again, in the absence of sunshine carbonic acid is exhaled by the leaves and all the green tissues and by the other parts at all times.

§ 25. In addition, there are certain movements of special secretion and excretion performed in a rudimentary way. Some

of the juices of plants, as acids, resins, and oils, seem to be of the nature of excretions, but whether they are such, or whether they are modifying agents of assimilation and disassimilation seems to be very imperfectly known. The substances which remain in the plant but no longer contribute to the evolution of the structure of course are instruments of disintegration and dissolution by impeding the vital movements, and finally stopping them altogether.

THE REPRODUCTIVE SYSTEM IN PLANTS.

§ 26. Reproduction in the vegetal kingdom is accomplished by a separation of vitalised matter from the parent plant. The primitive cell-plant after acquiring a certain increment by processes of nutrition and growth divides itself into two or more new cells. If these latter cohere into a tissue assuming a definite form the process is called growth; if they separate, each one still abiding separate, it is *reproduction*.[1] In other words, after securing the integration and evolution of the individual, there is provided a surplus of organised matter of the same kind as that of the individual structure which separates itself from the parent and becomes the germ of a new individual life. It is in the flower that the process occurs, and the fruit is the ripened product.

§ 27. There are two general methods of reproduction, one of sexual generation called *gamogenesis*;[2] the other of asexual, called *agamogenesis*. The first and most common of these is propagation through coalescence of organs of two sexes, or the products of those organs; the second is the negation of this process.

§ 28. The essential act in gamogenesis is the union of two cells, the one the germ-cell or female, the other the sperm-cell or male. In the centre of the flower, of flowering plants, are certain modified leaves called pistils, so folded together as to form a receptacle at the base, which is termed the *ovary*. The ovary develops from its inner surface small bodies, altered buds, which are termed *ovules*. At the end of each ovule is a cavity called the *embryo sac* containing a mucous, granulous and greyish protoplasm. This is the female apparatus for generation. Within the flower are also developed stamens—filaments corresponding to the petiole of the leaf at the end of each of which are modified blades called

[1] Wood's *New Botany*, 751.
[2] See Haeckel's *History of Creation* and *Evolution of Man*.

anthers. Within the cells of the anther is produced the *pollen*, which is a small yellowish dust, each grain of which is a membranous cell containing a fluid in which are minute molecules. When the membrane is exposed to moisture it swells and bursts, discharging its contents. This is the male reproductive structure. Sometimes the male and female organs are united in the same individual, in which case the plant is termed monœcious; sometimes the pistils only are formed in one plant and the stamens in another, in which event the species is diœcious. The pollen is shaken or carried from the stamens upon the pistils, and penetrates into the embryonary sac of the ovules where the contents of the pollen cells blend with the cells of the protoplasm contained in the embryonary sac. An independent development then takes place, the fertilised cells separating and forming by division a mass of spherical cells. This constitutes the embryo which continues to mature into the seed, containing the embryo and a store of nutritive material to supply the germ with food upon its growth after detachment from the parent stem until its roots can get a hold in the earth and draw thence its supplies.

§ 29. The simplest mode of agamogenesis is by division. The individual merely falls into two parts by a contraction in the middle, each half becoming an independent individual. This method of generation is found among the Protista and among the lowest representatives of the vegetal kingdom. Next to propagation by division is *gemmation*, or reproduction by buds. The difference between this method of propagation and the former is obvious in the inequality of the original and the produced stem, whereas in the former case their equality is marked. In gemmation the offshoot is inferior in development, and the relation of child to parent begins to appear. Sometimes the offshoot remains connected with the parent stem forming the branches and at other times becomes separated and forms an entirely disconnected individual. There is a disposition among biologists to regard each branch from a parent axial stem as a distinct individual, in which case we have frequently in the parent stem propagation by agamogenesis (gemmation), and in the flowering of the branch axes a propagation by gamogenesis. A third method of asexual genesis occurs by the formation of germ-cells or spores, and is found in the acrogens and thallogens. These spores are produced in immense numbers on the surface of the plants, or in the interior, but not in proper specialised portions like flowers, the vegetals

being destitute of flowers (Cryptogamia). These spores are thrown off from the parent and then multiply by division. In other cases of non-flowering plants there is gamogenesis through male and female organs resembling pistils and stamens—*archegons* and *antherozoids*—through whose conjunction or the conjunction of whose products fecundation is effected in similar manner to that already described.

§ 30. In reality reproduction is a process of discontinuous development. The germ is part and parcel of the parent substance and its growth is nowise different from the growth of the original, except so far as modified by different environments. Hence to the offspring there is carried over a portion of the structure of the parent, and, subjected to the same conditions of the action of forces, it will reproduce the parent structure and functions. Heredity, therefore, is established as a necessary consequence of reproduction.

§ 31. The difference in method of generation described by the terms *gamogenesis* and *agamogenesis* has laid the foundation for the most general division of plants—namely, into *Phenogamia* or *Flowering*, and *Cryptogamia* or *Flowerless Plants*. Some of the flowerless plants however, as we have seen, do propagate by gamogenesis, though not developing a perfect sexual system.

THE MEDIA OF VEGETAL LIFE.

§ 32. We have now in a very general manner set forth the characteristics of the different systems of functions exhibited in vegetal organisms and also the leading characters of vegetal structures. But we have done nothing to explain the moving causes which initiate and carry through the changes making up the course of organic vegetal life. This we will now attend to, proceeding from the internal to the external media.

§ 33. It has been already remarked (§ 12) that plants consist chiefly of carbon, oxygen, hydrogen, and azote or nitrogen. Of these the first exists in a larger and the last in a smaller proportion than either of the others; the proportion of carbon is from forty to sixty per cent. In addition to these four organogens there are earthy or mineral elements varying in different species. We have also noticed that the food of plants is derived from earth, air, and water, and have adverted to the methods by which the substances of nutritious quality are introduced within the organism. We found that water holding various earths in solution

is absorbed through the roots, dissolving in its course small portions of gum or sugar previously deposited and passing finally to the leaves, where, through the action of chlorophyll, the most noteworthy movement toward assimilation occurs, by the imbibition of carbonic acid from the air, its decomposition, and the retention of the carbon while the oxygen is exhaled. The result is a concentrated juice, consisting of carbon and water (HO) with a small portion of azote and also small portions of mineral substances. Out of this fluid in its descendant progress is built up the cell material. This we have seen (§ 12) to be an outer layer of cellulose ($C^{12}H^{10}O^{10}$), and an inner albuminoidal layer containing azote in addition to the three organogens just named. This last is sometimes termed *the primordial utricle*, and its substance protein or protoplasm. The deposits that are made are not wholly for the service of immediately repairing wasted tissues but also they serve the purpose of furnishing a reserve of nutritious matter for future use, being afterward drawn off by the sap to furnish material for the development of folial and floral buds and for the nutrition of the tissues; as when or before the leaves appear in spring the need of a special store of food is felt, the plant or the environment being in such a condition as to interrupt the inflow of the wonted supply. Such deposits are made in the beetroot, or the tuber of the potato and in the fruit of all plants. Generally speaking these stores are of gum, starch, and sugar, all of which are composed of carbon, oxygen, and hydrogen, in slightly varying proportions.[1]

§ 34. It appears then that the inner medium of plant life is a blastematic liquid, formed by absorption of liquid elements of the plant structure, containing in solution various substances of organic and inorganic nature, which liquid is modified by contact with the structure it passes through, and affected by absorbed water, air and gases. Its elements are principally carbon, oxygen, hydrogen, and nitrogen. The carbon is derived from the decaying vegetal matter of the soil drawn in with the water at the roots and from the carbonic acid of the atmosphere, decomposed at the leaves. Oxygen is absorbed by the leaves and all green tissues in the absence of direct solar light, and by the roots, flowers, and fruit at all times, and also is derived from absorbed water. Hydrogen is drawn from the water and from ammonia (NH^3), which latter is derived both from decaying

[1] Cf. Wood's *Botany*; Letourneau's *Biology*.

organic matter absorbed through the roots, and also absorbed from the atmosphere. Nitrogen is derived from ammonia and from the nitric acid of the atmosphere. The life then of the vegetal consists in a continuous movement both mechanical and chemical of adjusting introduced substances to the structure of the organism, pushing out disassimilated and disintegrated material and intercalating everywhere fresh matter of similar character to the structure. The natural query then is, what causes and sustains this vital movement? Such a question cannot be answered without a reference to the cosmological or external medium.

§ 35. We have just remarked that the vital action is both mechanical and chemical. The methods of mechanical movement are well understood and have been noted. The chemical changes for the most part are susceptible of analysis. The presence of azote and of numerous salts and mineral substances introduced into the plant facilitate chemical change, although it should not escape our attention that azote exists in plants in a much smaller proportion than in animals, and that hence relatively plants have a much less degree of molecular mobility. The functional vital activities of plants whether mechanical or chemical depend very extensively upon two kinds of external molecular motion, namely, *heat* and *light*. Vegetal life exists only within a range of temperature varying from 0 to 60 degrees (centigrade), seeds however being less susceptible to extremes and living both a little below and a little above these limits. The influence of heat in promoting molecular changes is very great, and in the case of plants a mechanical movement is directly dependent upon calorific action. I refer to evaporation, by which room is made for the advent of liquids forced or drawn into the plant from below. The necessity of solar light is equally great. The calorific and chemical rays have a potent effect in directions similar to those in which all caloric action moves. Moreover the presence of light is essential to the chlorophyllic changes. Were it not for light almost the whole of vegetal life would become extinct.

§ 36. Heat and light movements are sufficient and essential in order to initiate and carry forward vital movements and are hence the promoting causes of vegetal evolution. But they are not, at least immediately, the sources of structural supply. There must be an external environment of air, earth, and water. Given these three and the former, we have the chief elements in the cosmological conditions of vegetal life. As these elements vary, so plants vary in their structures and functions. The details of these

variations lie outside the scope of this work. It is sufficient to say that they exhibit in the evolution of organisms a continuous adjustment of inner to outer relations.

VEGETAL DISINTEGRATION AND DISSOLUTION.

§ 37. Of course if the sustaining conditions of life are withdrawn from the cosmical medium in the environment, the vital processes cease, and processes of dissolution and disintegration supersede those of evolution and integration. The sudden withdrawal of light and heat, for example, we can readily see would bring life to an end; as would also a shock from the impact of some foreign body powerful enough to disintegrate the structure at a blow. But it is not so obvious how in the natural course of a vegetal evolution dissolution must ultimately follow, even when the environing conditions are essentially the same as those which fostered life and integration. Nevertheless such is the case and it is only an instance of the general law of evolution itself. Every course of evolution and integration carries with it an inevitable sequel of disintegration and dissolution, as we saw in a preceding chapter (Chap. XVII. § 23, 24). The integration of every plant, like the integration of every other material body, is accomplished in connection with a necessary concomitant dissipation of motion. The consolidation of the structure itself tends to resist, oppose and diminish the movements which have produced this consolidation. Vital functions are hence clogged, as we say. At first the homogeneity of the seed structure is expanded into an increasing heterogeneity of stems, branches and leaves—its uniformity into multiformity. Then with this comes an increasing definiteness in the segregation and consolidation of like units; this integration opposes resistances to the forces which worked it; until finally it brings the motions of these forces to a close. An equilibration being thus effected, the resisting force of the structure first balancing and then over-balancing the movements of vital evolution, the evolutionary movement ceases. This having ceased we have a whole which has been made homogeneous, with its inevitable tendency to lapse into heterogeneity; and heterogeneity is wrought this time by the action of those disintegrating and dissolving forces which are always at work in anorganic nature. Evolution does its work of integration; and when the integrated structure stops evolution, disintegrating forces initiate and consummate changes which work its dissolution.

ANIMAL STRUCTURES IN GENERAL.

§ 38. The elementary types of animal structures are not perceptibly different in kind from those of vegetal structures. Both seem to have their origin from structureless matter of sarcodic or blastematic character. The primitive forms in both kingdoms are the cell and next the fibre; and combinations of these constitute the tissues, out of which the differentiated and integrated varieties of animal life are evolved and display themselves. Nevertheless there are marked differences in constitution between animal elements and vegetal. The most important perhaps is the presence of an increased amount of azote in the animal structures. In plants the presence of cellulose is the primary feature of the structure; that of the azotised membrane is secondary (§ 12). With animals, on the contrary, the cellulose investment is absent and the elements are formed by the quaternary albuminoidal substances to a prevailing degree. In the second place, there should be observed as a point of difference the greater amount of consolidation of cells into tissues in animals, their greater variety, and the more complete abrogation of the original cellular form.

§ 39. Four types of animal anatomical elements may be mentioned: (1) the elements of the cellular or connective tissue; (2) the cells which are autonomous; (3) the elements of the muscular tissue; (4) the elements of the nervous tissue. (1) The cellular or connective tissue constitutes the general substance of the animal. It is composed of stellated cells, enclosing a nucleus with a nucleole, and sending out fibrillary prolongations which unite with those of other cells to form a network of fibre. Other fibres called laminous, because slightly flattened, form themselves in that same cellular tissue around elongated nuclei, called embryoplastic nuclei. The whole resembles a long wire-drawn spindle, the laminous fibres forming the chief part of the tissue. This cellular tissue has various degrees of consistency and includes cartilage and bones. The cartilaginous and the osseous cells are all nucleated; the first are ovoid, the second are irregular, and emit in every direction filiform prolongations anastomatically intertwined. (2) The autonomous cells comprise the globules of the blood and the epithelia, the latter serving to line and protect animal membranes and also *to furnish* a structure for secretions. (3) The muscular elements

are distinguished by the quality of contractility. This quality is found in primary sarcodic matter, which is an amorphous semi-fluid substance, coagulating at forty degrees. Differentiated from this occur minute ciliary fibres, then fibro-cells, then fibres, then bundles of fibres. Whether the fibre or the cell is the sole primitive form has not been determined. The fibro-cells are characteristically fusiform, more or less flattened, provided with one or more nuclei, and capable of compressing or of swelling them selves out by contraction. The typical muscular fibres are of two kinds, the *smooth* and the *striated*. The former in man and the higher vertebrates appear to be elongated fibro-cells; elsewhere they seem to be very fine threads without nuclear enlargements, and without divisions. The latter consist of very thin fibrils exhibiting alternately in the direction of their length transparent parts and dark parts of the same extent. These fibrils in juxtaposition form bundles contained in an elastic transparent sheath. (4) The nervous tissue we reserve for a separate examination in the next chapter, since its connection with mental processes makes a more special attention imperative.[1]

§ 40. The animal structure in its earliest stage is called the *ovum* or *germ*, which is a nucleated cell of protoplasmic matter, which grows first by division into a plurality of like cells, from which organs are differentiated. The divisions thus formed are in their earliest stages termed *blastomeres*. In the protozoic animals development takes place directly from the protoplasm of the germ into those tissues which constitute the adult body without division into cell aggregates; or else where division does take place, a permanent separation into distinct individuals occurs and the process is not growth but reproduction.

§ 41. Structural growth proceeds by differentiation sometimes without reference to an axis of symmetry and sometimes with reference to one. In the latter case the parts of the body which become distinguishable sometimes correspond on the two sides of the axis (bilateral symmetry) and sometimes correspond along several lines parallel with the axis (radial symmetry). The bilateral or radial symmetry may be further complicated by its segmentation or separation by divisions transverse to the axis into parts each of which corresponds with its predecessor or successor in the series. In the segmented body the segments may or may not

[1] Condensed from Letourneau's *Biology*, Bk. I. Chap. V.; Bk. V. Chap. III.

give rise to symmetrically or asymmetrically disposed processes which are appendages, using that word in its most general sense.[1]

§ 42. There are found in the animal kingdom six principal modes of structure, which furnish ground for the following divisions:[2]—

Protozoa.	Annulosa.
Zoophyta.	Mollusca.
Echinodermata.	Vertebrata.

Protozoa.—These are the lowest forms of animal life, yet the class does not include the Protista, or kingdom of doubtful individuals. It embraces the Archezoa, Gregarinæ, Infusoria, Planæadas and Gastræadas. The Archezoa or archaic animals are the simplest forms of animal life, and consist either of a simple cell or portion of sarcode, or of an aggregation of several cells perfectly similar one to another. The Gregarinæ are parasites living in the intestines and body cavities of other animals. They are either simple cells or chains of two or three identical cells in a series. They differ from the Archezoa by the possession of a thick simple membrane which surrounds their cell body. The Infusoria are probably single-celled animals and have small vibratile cilia or fringes by which they move; the Acinetæ take their food by fine sucking tubes. The Planæadas and Gastræadas are now extinct, but represented in embryos of higher animals in the larva stage.

Zoophyta or *Cœlenterata* embrace the Sponges (*Spongiæ*) and the Sea-nettles (*Acalephæ*). They include structures which, though animal in distinctive features, yet have a form resembling the forms of plant-life, and from this fact they derive their name. Corals, polyps and jelly-fishes are here found. The zoophytes have a system of alimentary canals with a central cavity into which all the other cavities of the body enter. So far as structural form is concerned and method of growth they are best described as plant-like.

Echinodermata.—The characteristic feature of these animals so far as external form is concerned is radial growth. The body consists of five or more radii, standing around the main axis of

[1] Huxley's *Anatomy of Invertebrated Animals*, Introduction and Chap. I.

[2] Out of the many systems of division of animal structures I have selected what seems to me the best. On the whole, I am disinclined to admit the rank which Haeckel assigns to Vermes, and prefer to class them with insects under the name Annulosa.

the body where they meet. The star-fish is the type of this class.

Annulosa.—This includes the so-called longitudinal type of growth, consisting of identical parts arising on both sides of an axis and closing up along a line opposite the axis. The characteristic feature (not always present however) is that of rings or segments of the whole body, more or less closely joined. Insects and worms are the two most prominent sub-divisions; Haeckel makes each of these a full main class under the names Vermes and Arthropoda.

Mollusca.—With these animals the development produces identical parts curved in a mass around a conical or other space. Mussels and snails are examples.

Vertebrata.—In vertebrate animals the leading character is a segmented axis, on both sides of which the development produces identical parts, growing upwards and downwards, and shutting up along two lines, so that the inner layer of the germ is enclosed below and the upper above.[1]

The foregoing classes do not represent any linear order of development, nor do they necessarily exhibit final results in the way of classification. The invertebrata are especially liable to future revisions. But what is here given comprises the principal groups of animals as defined by differences in structure.

THE INTROSUSCEPTIVE SYSTEM IN ANIMALS.

§ 43. Introsusception in animals, as has been already observed (§ 3), is effected both by absorption and by prehensive or muscular action. We notice four chief methods:

(1.) The absorption of atmospheric air and its constituents through the periphery of the body by simple diffusion.

(2.) The absorption of water and other liquids with substances in solution by simple diffusive action.

(3.) Introsusception by a special prehensive apparatus for promoting the introduction of circumambient air or water, or both. This apparatus is exemplified most conspicuously in the Tracheæ of insects, the Branchiæ of fishes, and the Lungs of the superior animals.

(4.) Locomotive prehensive apparatus, by which the animal

[1] For the characters of the vertebrates in detail the reader is strongly recommended to consult Huxley's *Anatomy of the Vertebrated Animals*, as well as its companion work relating to the invertebrated.

may bring itself into proximity with its food and may grasp and secure it when brought near.

§ 44. The periphery of animal structures varies in different species as to permeability. In the lower organisms the air penetrates directly through the limiting surfaces; in the higher organisms, this is also largely the case, the epidermic covering being sufficiently porous to admit of this. Similarly there is an absorption of water and of its constituents. Some animals, as the parasitical gregarines, take all their nutriment by absorption along the whole surface of the body. Permeation, generally speaking, is effected in many cases by osmotic action. The tracheal apparatus is a system of canals, having two principal branches extending longitudinally and parallel with each other throughout the body, having at intervals points from which numerous branches extend corresponding with external orifices called stigmata or spiracles, and having analogy with the similarly-named apertures upon the surface of plants. Through these apertures and canals the atmospheric air circulates, the entrance and expulsion being assisted by abdominal muscular movements. The branchiæ constitute a special organ for aquatic respiration, admitting the water to their surface and absorbing from it the oxygen while returning to it carbonic acid. The gills of fish are the types of this form of respiration. The lungs are cellular bodies contained in the cavity of the body, which are traversed by blood-vessels and are capable of being inflated with air and also their gaseous contents discharged by a muscular action called respiration. The action is alternate inhalation and exhalation.

§ 45. The locomotive-prehensive apparatus is made serviceable by co-ordinated movements of the various parts of the body through contraction and dilatation of the muscular tissue. Among the lowest orders of animals the locomotive organs are vibratile cilia or a simple sub-tegumentary contractile apparatus near the surface of the body, which effects such a movement as worms make. In the higher orders the muscles are inserted into hard portions of the body, as the bones, on which they impress the movements of their contraction and dilatation. This contraction is stimulated by mechanical impact, by chemical, by galvanic or electrical communications. Its most important excitant, however, is that which not only provokes given muscular actions, but also co-ordinates all of them. This is accomplished by the nervous system. As a result we have a power of regulated movement

from place to place and of adjusting the different portions of the body to each other and to external objects, so as to bring the organism into close contiguity with suitable food and then to grasp and convey that food into a cavity of the body where assimilative action upon it can commence. Such an arrangement is favoured by a structure which has limbs or minor appendages to the body, admitting of a variety of movements, some principals and some subsidiary, either accessory to the movement of the whole or independent of it.

§ 46. Repulsion is secured by the same apparatus which is effective for introsusception and in addition is guaranteed by various peculiarities of the structure which offer resistance to the penetration of destructive agents. General compactness and solidity are obtained in the vertebrates by the endoskeleton which furnishes a durable axis of development upon and around which the other parts attach themselves; this is either axial, belonging to the head and trunk, or appendicular, belonging to the limbs. Among the invertebrates, though the endoskeleton has not the same importance that it has in the vertebrates, it is also found subserving somewhat the same office; but whether present or absent, there is always a greater or less tenacity of structure which, so far forth as it exists, tends to preserve the integrity of the individual. At the periphery an exoskeleton frequently is quite distinctly protective and repulsive. Among the vertebrates there exists a protective covering called the skin, and by the hardening of this integument a still more effectually repellent structure is formed in many cases. This is exemplified in scales, dermal plates, hairs, feathers, barbs, horns, spurs, nails, beaks, claws and teeth; some of which serve the double purpose of repulsion and prehension. Among the invertebrates we meet with hard protective structures of exoskeletal character, such as the hard periphery of beetles among insects, and the shells of many molluscous animals. There is also the dermal covering. Of course the locomotive system enables the animal to flee from danger. The great size of some creatures renders them formidable to resist attack. With others there is some special and peculiar means of defence, like that of the skunk in emitting a mephitic odour, or the poison of the serpent, which is as well a weapon of offence and thus of prehension. Wherever a prehensive or predatory apparatus exists its capability for defensive use is implied.

THE DIGESTIVE-CIRCULATORY SYSTEM OF ANIMALS.

§ 47. The food of the animal is introduced into a cavity of the body or into what is termed the alimentary canal, through which it passes and in its course is subjected to various mechanical and chemical modifications; a portion of it as thus modified is then taken into a system of circulation by which it is carried to all parts of the body and assimilated to the structure. The first part of this process is termed *digestion*; to the latter portion the name *circulation* is ordinarily restricted: the circulatory system is, however, only an extension of and appendage to the digestive: both taken together complete the animal's system of assimilation.

§ 48. The digestive cavity varies from a simple orifice of ingress as in some of the infusoria, or a central constant cavity as in the cœlenterates, to a complicated arrangement consisting of tubes or canals with one or more enlarged sacs along their course and various appendages besides. In the highest developments there is an alimentary canal whose chief divisions are the mouth, the œsophagus, the stomach, and the intestines. The variety in the organs of digestion and circulation is so great that we shall be obliged to content ourselves with a typical description of those organs and their processes as they appear in the higher vertebrates at the head of which class man stands, remarking, however, that in the lower animals the modifications of this general type, though very great at first sight sometimes, are after all varieties of detail rather than alterations of the general plan of animal alimentation above described.

§ 49. The introduced aliments are mechanically reduced by a tearing or crushing apparatus like the teeth or the gizzard and also by the action of liquefying secretions poured upon the food in its passage. The saliva in the mouth is the first of these; its action is lubricating and dissolving and also chemical in effecting, among other things, the change of starch into sugar. In the stomach the food is still further triturated and dissolved by the muscular action of the coats of the stomach and the introduction of the second important modifying secretion, the gastric juice, which acts as a powerful solvent especially of azotised substances and likewise as an agent of chemical transformation. Its action is that of an acid, which is the chief agent of disintegration, and also that of a peptic, which accomplishes the transformation of albuminoidal alimentary substances into peptones isomeric, but

soluble, assimilable and no longer coagulable by heat. As treated by the stomach and its attendant forces all digestible matters of introsusception are reduced to a soft mass called *chyme*, and thus pass into the intestines, carrying along also substances not digested and destined to be excreted. In the intestine the aliment is subjected to the action of two more principal secretions, the hepatic and pancreatic. Their action, which is a commingled one, accomplishes a further liquefaction and various chemical changes: the gastric acid is neutralised by the alkaline character of the new secretions; fat bodies, not affected by the gastric juice, are emulsionised; amyloidal and saccharine matters are metamorphosed into dextrine and glycose; proteic substances are transformed into peptones. Affected by these modifications and the muscular peristaltic motion of the intestines, the mass of reduced matter proceeds along the intestines, and at last is excreted after undergoing also the organic processes now to be described.

§ 50. Throughout the whole course of the aliments in the alimentary canal, wherever matter is prepared for assimilation it is drawn out of the canal itself either by osmosis, diffusion, or by movement through minute canalicules into the vascular system. This especially takes place in the intestines after the action of the various digestive secretions. The surfaces with which the aliment is brought in contact are filled with vessels which absorb or into which is absorbed the prepared nutriment. These connect either directly with a system of veins or indirectly after having passed through a subordinate system of canals called lymphatics. These veins contain also some of the products of disassimilation on their way to excretion. A fluid is thus formed containing in solution both nutritive and waste material, which, subject to assimilative and excretory depletions on the way, is poured into a central organ of circulation, the heart. By muscular force it is thence propelled to the lungs, where being diffused through the pulmonary surface, the excretory gaseous products are exhaled and replaced by the oxygen of the atmospheric air. The diffusion is accomplished first by veins and then by the minor vessels called capillaries, whose surfaces are brought into contact with the intromitted air. From the capillaries, the nutritive fluid, changed now by oxygenation from venous to arterial blood, is collected through the cellular connective tissue into another system of canals by which it is returned to the heart and thence propelled through the

arterial system all over the body and again into capillaries. Along the routes of this arterial flow the final consummation of assimilation takes place, the nutritive elements being removed from the blood and added to the tissues. Together with this there is the corresponding movement of disassimilation, and the disassimilated products, with what is left of the arterial blood, pass through the tissue and through canals into the venous system. The return to the heart is thus commenced, and on the way, as before indicated, the excretory substances are thrown off and the nutritive elements taken in.

§ 51. Assimilation is a process of addition to the structure of new material which is like or has been made like the original constituents of that structure. The tissues are renewed and repaired. This implies, however, that they have decayed and disintegrated. Exactly how this disassimilation takes place is not well understood. It seems to be largely a process of oxydation, the arterial blood bringing oxygen to the tissues and there occurring an exchange of oxygen and carbonic acid, the latter falling into the circulation and being carried out into the circumambient medium through exhalation. Besides, water charged with a great variety of mineral substances exists as a product of disassimilation, so also a vast quantity of chemical compounds showing a constant and multifarious chemical action. Oxygen is doubtless the chief determining agent in these disassimilation changes. The tissues burn; their ashes are taken away and their waste is repaired. But the details of assimilation and disassimilation within the organic tissues we cannot give, not in this instance merely from want of space, but also because concerning them comparatively little is scientifically verified.

THE EXCRETORY SYSTEM IN ANIMALS.

§ 52. Exhalation through the pores of the skin is one of the most important methods of elimination of waste products to be found in the animal kingdom. In the inferior animals there is a direct passage of the expulsed matter across or through the tissues without the intervention of any special organ. Then there is also excretion at the skin accompanied with a secretion, whose office is chiefly excretory, namely the sweat. Exhalation likewise takes place very prominently wherever the respiratory apparatus is found, introsusception and expulsion being accom-

plished by the same set of organs. In addition, we have referred to the residue of introduced aliment after the nutriment has been taken out in the process of movement through the alimentary canal. By muscular action this is pushed out of the organism. Lastly we notice that very important liquid secretion and excretion, the urine, into which is poured from the blood and tissues a vast quantity of disassimilated matter thence to be carried out of the animal body. These four are the principal ways in which expulsion is effected in the normal course of animal life.

THE REPRODUCTIVE SYSTEM IN ANIMALS.

§ 53. Like plants, animals propagate both by agamogenesis and by gamogenesis, the latter however being the usual method among all the higher animals. Agamogenesis is frequently effected among the Monera by division, among the Zoöphytes by germination (see § 26 ff.), among worms by the formation of germ buds which at an early stage separate themselves from the parent body, among insects by the formation of germ cells (parthenogenesis). These processes wherever they occur are not essentially different from corresponding processes in plants.

§ 54. Nor is the method of gamogenesis in any wise materially different in the animal kingdom. It arises from the union of two specialised cells or sets of cells, the one male and the other female, sometimes both contained in one individual, usually the two sexes in separate individuals. The female cell is termed the *ovum* or *ovulum* and is composed of an enveloping membrane, the *vitelline membrane*, of a content of protoplasm, the *vitellus*, of a nucleus or *germinative vesicle*, of a nucleole, or *germinative spot*. The whole forms a germ enclosed in a nutritive mass. The male cell also contains a nucleus enclosed in protoplasm. After reaching a certain degree of maturity it breaks up into a number of cells from each of which comes forth a mobile corpuscle called *spermatozoary* or *zoösperm*. The contact of this male element with the female ovulum produces fecundation and thence embryonic growth.

§ 55. The development of the reproductive elements within the organism is accomplished by special sets of organs and results from a superabundance of nutritive material, which is carried to these organs to be elaborated. This material is withdrawn from the blood after having been brought to its highest point of nutri-

tive perfection. These organs are: in the female, the *ovary*, where the ovum is formed, the *uterus* or cavity in which the germ develops, with attendant ducts for extrusion, which also sometimes serve the purpose of conjugation; in the male, the *testes*, in which the male elements are formed and which also have ducts for excretion. The organs for reproductive excretion are modified to suit the methods by which the male elements are brought to the female.

§ 56. Impregnation, or the fruitful union of the male and female elements, may take place subsequently to the extrusion of the ovum, in which case the development of the embryo occurs without the body, as in some of the species termed *oviparous*. Impregnation also takes place in many cases before the extrusion of the egg, and then a certain degree of development occurs before the embyro is finally separated from its parent; in this case we find *viviparous* species, and some *oviparous* species, the development in the latter case being slight. In some cases the development proceeds within the body of the parent but quite unconnected with it; in this case the species is *ovoviviparous*. Where impregnation takes place within the body, there is a special apparatus for intromission of the male element. The essential parts of this are in the male a *penis*, or organ of intromission, and in the female a *vagina*, or sheath for reception. Where intromission is not required these organs pass into simple excretory canals.

§ 57. When the development proceeds outside the body it is sometimes, as in the case of ordinary fishes, independent of parental aid; sometimes it is supported by the parent supplying the requisite amount of heat in the process of incubation. Development begins by the separation of the vitelline substance into cleavage-masses (blastomeres), first two, then four, then eight and so on. The germinal vesicle disappears, but each cleavage mass contains a nucleus. The cleavage-masses become very small and are called embryo-cells, as the body of the embryo is built up out of them. These cells fix themselves on the internal face of the vitelline membrane and thus form a membrane limiting a hollow sphere full of an albuminous liquid. This membrane is called the *blastoderm*. The blastoderm separates into two distinguishable membranes; the external is called the *serous* or animal vestment (*epiblast*), because from it most of the apparatus and organs of animal life take their rise; the internal is called the *mucous* or vegetative vestment (*hypoblast*), and from it is developed the

nutritive apparatus. From the epiblast and hypoblast is also separated the *mesoblast*, which is the source of all the structures (save the brain and spinal marrow) which are included between the epidermis of the integument and the epithelium of the alimentary tract and its appendages. The cells of the blastoderm accumulate around a centre which is called the *embryonic spot* and there the embryon develops itself, in the course of its development exhibiting in regular and successive order the characteristics of the animal types which are inferior to that which it finally reaches. The beginning of the vertebrate column, when it is to appear in the matured embyro, is seen at a very early stage in a line or groove in the depth of which is formed a solid cellular cord, called the *notoçord*, around which the vertebral column is constructed. Vascular connections with the parent body furnish nutriment for the embryo among viviparous animals; the substance of the ovum itself supplies it with the others, heat promoting the development. Among the mammalia, the young are supplied from the parent body after birth by the secretion called *milk*.[1]

THE MEDIA OF ANIMAL LIFE.

§ 58. The internal or physiological media of animal life are the blastematic and plasmatic liquids, the introduced substances, and a variety of forces generated within the tissues themselves. The former comprise (1), The Blood; (2) The Lymph; (3) The Interstitial Liquids; the latter embrace (4) The Alimentary Substances, together with absorbed and inhaled matter; (5) The Secretions; (6) The Excretions; (7) Miscellaneous produced substances and forces modifying the animal structure or functions, or both.

§ 59. The composition of animal bodies is not essentially different from that of vegetals. The four organogens are the prime constituents, and exist in varieties of combination with each other and with the subordinate elements. 'There is no radical difference between the organic substances of the vegetal kingdom and those of the animal world. Nevertheless there are notable dissimilarities; they bear on the relative quantity of the ternary compounds non-azotised and the quaternary compounds azotised, in both realms of nature. In effect, the albuminoidal

[1] This subdivision is chiefly condensed from Letourneau's *Biology*, Bk. IV. Chap. IV., and Huxley's *Anatomy of Vertebrated Animals*, Chap. I.

substances which constitute the chief part of any veritable animal organism are from the quantitative point of view mere accessories. The great mass of every true plant is especially constituted by the non-azotised carburetted substances. Azote, though forming an essential element of the intercellular vegetal protoplasm and of the alkaloids, represents often in weight less than a hundredth of the dry matters; rarely the proportion rises to three hundredths. To sum up, the vegetal kingdom, quantitatively considered, is the kingdom of ternary carburetted substances, while the animal kingdom is that of carburetted substances azotised or quaternary. Consequently there is in the animal world a greater degree of chemical complexity and instability; that is to say, a superior vital activity.'[1]

§ 60. 1. *The Blood.* The composition of the blood is very complex. It contains substances of all the three classes we noted in the last chapter (Chap. XIX. § 9), as appertaining to organic matter. The most important element is water (though not in a free state), which contains all the others in a greater or less degree of solution. The exchange of oxygen for carbonic acid we have already noted (§ 48, 49), thus marking the chief difference between arterial and venous blood. In addition to the various elements of the three classes just spoken of, a notable peculiarity is the existence in the blood of organic globules. Among the vertebrates the *hæmatia* or red globules are found in immense numbers, together with the *leucocytes* or white globules; among the invertebrates we find the latter only. The office of the hæmatia seems to be to transfer oxygen to the tissues, and take back carbonic acid. The functions of the leucocytes are not known, but it is conjectured that they are immature haematia.

2. *The Lymph.* This is a plasmatic liquid which must be regarded as an adjuvant to the blood circulation. It contains leucocytes and also the same elements as the blood. Its movement is slow, and its composition varies more than that of the blood. The nutritive matters it contains are poured into the blood.

3. *The Interstitial Liquids.* These are animal blastemas which bathe the tissues and fill the cellular and inter-cellular spaces, renew the structure and take away disassimilated products. They contain principally water charged with salts and albu-

[1] Letourneau's *Biology*, Bk. I. Chap III.

minoidal substances, but their composition is different from that of the blood and lymph. In these liquids the nutritive matters seem to reach their highest degree of assimilative elaboration.

4. *The Aliment.* The food of animals is organic matter. They do not manufacture protein; they are dependent upon plants and other animals for nutriment which is still further to be modified by the digestive system. Inorganic substances are required, but they alone will not support animal life. Organised matter, then, mingled with inorganic substances, as salts and water for example, make up the aliment, which is changed at every step of its progress by the digestive-circulatory agents before described. Its own substances also have of course their reactive influences on the modifying forces.

5. *The Secretions.* The important part in the animal economy which the secretions play has already received its comment. They are *produced humours* as distinguished from the plasmas and blastemas which are *constituent humours.* None of the former is living; none is endowed with the property of continuous renovation which distinguishes the plasmas; their water is in great part free and contains salts directly dissolved; each contains one or more quaternary principles not found in the blood (peptine, pancreatine, &c.). They are alkaline save three, the gastric juice, the sudor, and the urine, the last being sometimes alkaline also.

6. *The Excretions.* These contain the residue of the introduced alimentary substances, the products of disassimilation and the surplus of produced humours.

7. *Miscellaneous.* Heat generated within the organism is the most valuable product of organic processes in the animal not hitherto mentioned. This is produced by oxydation in the tissues and by the various chemical reactions going on all the time throughout the organism. 'Every organised body, especially every animal, is a fireplace, where diverse substances, mostly ternary or quaternary, burn, slowly developing heat which in its turn provokes or forms the exchanges of the chemical metamorphoses necessary to life.'[1] Among the various sources of heat attention may be called to muscular activity as a generator of caloric. Besides heat, there may be noticed a great variety of chemical forces, electricity to an undetermined extent, produced gases, the nervous force, which we are soon to consider, and abnormal substances developed within the organism.

[1] Letourneau's *Biology*, Bk. VII. Chap. II.

§ 61. In the cosmological medium heat is also required, and is a prime requisite for germ development. Though the internal temperature of the organism is ordinarily considerably greater than that of the surrounding atmosphere, yet a certain medium of warmth in the latter is necessary to sustain animal life. The exterior temperature must be sufficient to prevent congelation of the humours, and in the other direction it is found that a cold-blooded animal dies when a temperature 30 degrees above zero (centigrade) penetrates its anatomical elements; for the mammifers the highest limit is 45 degrees; for birds 50. Moreover light exercises a powerful influence in stimulating and developing animal life, though it has not that supreme importance which it has in the case of plants. Heat, Light, Air, and Water are the four chief environing requisites and promoters of animal existence. In addition to these the presence of the proper special aliments for each species is a necessity to the continuance of that species and all its individuals.

§ 62. The degree and manner in which the several cosmological environments vary accomplish also a variation in the species and the individual. In animal as in vegetal life there is a continuous adjustment of inner to outer relations. The reader is recommended again to turn to Mr. Spencer's table at the end of the last chapter to see exhibited the influences affecting the evolution of animal life and the results upon the destinies of individuals and on generic types. As before remarked (Chap. XIX. § 31), we have little scientific knowledge of the origin of either vegetal or animal life as such. Its evolution we can trace, but its beginnings and determining causes are as yet hidden from us.

ANIMAL DISINTEGRATION AND DISSOLUTION.

§ 63. Only for the sake of completeness is it necessary to make mention of animal death. This is merely the stoppage of life, that is to say the cessation of evolution and integration, brought about by the very perfection of integration, producing an equilibrium between the forces carrying on vital evolution and those opposing it. By integration of structure, motion is dissipated, the vital movements are diminished and finally brought to a close. Equilibration having been thus effected, the disintegrating and dissolving forces have full scope for their destructive operations. (§ 37.)

CHAPTER XXI.

THE NERVOUS SYSTEM.

§ 1. We learned in the preceding chapters that the most obvious characteristic of animals is their self-mobility, this latter subserving the purposes of the introsusceptive system of their functions. This self-mobility we found to involve a source of motion of the whole body located within the organism itself (else there would be no proper *self*-mobility) and also an ability to move the parts of the body with relation to each other. Observing both these phenomena in animal life we were at once led to inquire, What is the interior stimulus to motion and in what manner are motions of the organism co-ordinated? Manifestly, not only must there be a source of motion, but unless all the motions of the organism are controlled and harmonised for the benefit of the whole, the power of motion is valueless and may be destructive. Now in order that there may be a co-ordination of motions there must be some sort of intercommunication between the parts of the body which are susceptible of movement or which are affected by movement.

§ 2. The questions just asked and the others implied were answered summarily by a reference to the Nervous System. It is now our place to examine more specifically this system of central excitation and general co-ordination of animal movements. And in making such an examination we are straightway brought to the borders of the domains of consciousness.

§ 3. The Nervous System is a system of nerves and nervous matter. 'In its essential nature a nerve is a definite tract of living substance through which the molecular changes which occur in any one part of the organism are conveyed to and affect some other part.'[1] Nervous matter is animal tissue specialised to perform nervous functions. Every nervous apparatus consists of fibres and cells, in its ultimate composition, which exist in three principal forms; 1st, *Nerves* proper, or cords, which are bundles of fibres enclosed in a membranous sheath; 2nd, *Ganglia*, which are clusters of cells and fibres sometimes enclosed in a sheath and sometimes not; 3rd, *Centres*, which are points to which excitations proceed and from which they proceed. The nervous system has

[1] Huxley's *Anatomy of Invertebrated Animals*, Chap. I.

two general divisions, the Peripheral and the Central: the Peripheral is further subdivided into the Epi-peripheral System, which connects the surface of the body (relatively speaking) with the centres, and the Ento-peripheral, which connects the internal parts with the centres: the Central System is the aggregate of centres with their more direct connections.

§ 4. *Nerves* are bundles of fibres within a membranous envelope supplied with blood vessels. Each fibre has also its separate sheath having annular constrictions at various intervals. The central portion is composed of a quaternary azotised substance which for sake of distinction is termed *neuroplasm*, and is identical with the substance of nerve-cells. It is a very thin filament, solid and flexible. This central portion is the *Cylinder-Axis* or *Axis-Cylinder*. It is enclosed in an elastic sheath called the *Medullary* or *Marrow Sheath*, which is filled with a sort of viscous oil belonging to the family of fat bodies, transparent, rich in carbon and strongly refracting the light. Under the microscope the nervous fibres with oily envelopments seem limited by two dark parallel lines, whence the name *fibres with double contour*. The outside sheath, a tough elastic tube, is called the *Neurilemma* or *Nerve-Sheath*. These three parts make up the perfect nerve-fibre, but all the parts are not uniformly present. Some nerves have no medullary sheath but are only axis-cylinders surrounded by the neurilemma. When many nerve-fibres are united into a bundle these marrowless fibres are grey and more transparent, and are therefore sometimes called grey nerve-fibres. Those nerve-fibres which have medullary sheaths appear more yellowish white. If the nerves are traced to the periphery more and more nerve-fibres are continually found to branch off from the common stem, so that the branches and branchlets gradually become thinner. At last only separate fibres are to be seen, these being, however, still in appearance exactly like those constituting the main stem. Such fibres as up to this point have had medullary sheaths now frequently lose them and become exactly like the grey fibres. The axis-cylinder itself sometimes then separates into smaller parts. In the central organs very fine fibres much more delicate than the axis-cylinders occur. Again, in these organs too we find fibres without the neurilemma, being naked axis-cylinders. In all nerves the axis-cylinder is the primary and essential element. In the invertebrates and the lowest fishes there is either no medullary sheath or it is not separated from the axis.

§ 5. *Nerve-cells* are corpuscles of a somewhat irregular form, more or less spheroidal. They have a wall, a content, a nucleus, and a nucleole. This last, of a brilliant and yellowish colour, is included in a large transparent nucleus, which itself is surrounded on all sides by a granulous and solid substance. Usually a somewhat thick cellular membrane covers the whole, though this, according to Ch. Robin, is lacking in the cells of the nervous centres of the superior vertebrates. The diameter of nerve-cells varies from $0^{mm}\cdot020$ to $0^{mm}\cdot040$. They always are connected with one or more fibres, and according to the number of these fibrous prolongations they are called *unipolar*, *bipolar*, *multipolar*, etc. Inasmuch as the nerve-cells have a greyish tint the regions where they are massed in great numbers have the same colour, and thus the grey nervous substance is constituted as distinguished from the white or fibrous nervous substance. Apolar cells exist, and seem to be early or embryonic forms of multipolar cells, or perhaps cells broken off from previous connections.[1]

§ 6. The elements of nerve-cells and nerves or fibres make up a complex network, which permeates the organism. The central system occupies a position relatively central or axial, and consists primarily and chiefly of nerve-cells, but intermingled also with the fibrous processes of these cells proceeding to and from the periphery and connecting the centres, the whole making a plexus of cells and fibres with a predominance of the former. There is also to be noted a connective tissue, sometimes called neuroglia, which forms an amorphous substance whose nervous properties are not well understood, and which indeed may be, perhaps, without significance except as connective tissue save in so far as it contains cells and fibres. The centres are prominently ganglia, but not all ganglia are centres. The peripheral system extends to and from the centres in nerves or cords, some of which are *afferent*, that is to say, capable of transmitting molecular motion from the periphery to the centre, and others of which are *efferent*, that is, formed to transmit such motion from the centre to the periphery. The epi-peripheral nerves extend to and from the peripheral surfaces, while the ento-peripheral pervade the organs of nutrition and assimilation. Interspersed with the fibres of the peripheral system—in truth occurring in the course of these

[1] Letourneau's *Biology*; Rosenthal's *Muscles and Nerves*; Lewes's *Physical Basis of Mind*; Spencer's *Biology* and *Psychology*.

fibres—are here and there ganglion cells of similar structure to those in the central system.

§ 7. The function of the peripheral system is transmission of molecular motion; that of the central system is resistance to and initiation of such motion. In other words, the peripheral nervous organs are conduits of force, the central organs are centres of force. This distinction is not true absolutely, for the centres and their commissures transmit, while the nervous cords both accelerate and retard motion, through a force of their own; but nevertheless the statement is correct generally. We notice then as a peculiarity of nerve-cells as distinguished from fibres the facts (1) that excitement may arise in them independently of any visible external stimulus; (2) that they are able to transfer excitement from one fibre to another; (3) that they are able to retard, oppose, and extinguish existing molecular motion.[1] The changes which occur in these cells are probably destructive molecular changes with accompanying liberation of motion which proceeds along the lines of least resistance. Waves of molecular motion radiate from the centres toward the periphery. On the other hand, the changes involved in the transmission of molecular nervous motion along the nerves are probably not destructive and probably are isomeric. The method of nervous action is the following when it proceeds from the periphery inward: an excitation produced by irritation of an afferent nerve on or near the surface is propagated along the course of the nerve until it reaches a centre; it there excites molecular motions of the centres, and is reflected toward the periphery along efferent or motor nerves whose extremities are either attached to or run into muscles, whose contraction follows the advent of the nervous stimulus. When the nervous action proceeds from the centre outward it either is directed along specific efferent nerves as just stated, resulting in the accomplishment of definite peripheral muscular movements; or proceeds along courses of nerves running to the internal vital organs and stimulating their action; or resists incoming impulses; or is diffused generally outward, affecting more or less the whole system and becoming itself modified by other waves or currents of excitation. The property of nerves which accomplishes this molecular motion is termed *neurility*; the afferent motion is termed sensory motion, and the property of afferent nerves is sometimes termed *sensibility*; the efferent motion property is sometimes denominated *motricity*:

[1] Cf. Rosenthal's *Muscles and Nerves*.

but there is no essential difference between the structures of afferent and efferent nerves. These terms—*neurility*, *motricity*, etc.—explain nothing; they only serve to designate certain structural and functional qualities. *Neurility* indicates simply a structure capacitated for nervous molecular motion; *motricity* means the quality of producing or conveying nervous motor stimulation; *sensibility* refers to that inward motion which excites nerve-centres to action and which arouses those central motions which are finally accompanied by sensation.

§ 8. A nervous system having the foregoing essential features, but with sundry modifications of detail and with great variety of specific arrangements of parts, is found throughout the animal kingdom down to the lowest forms of animal life. Professor Huxley says: [1]—'Any one who has attentively watched the ways of a *Colpoda* or still more of a *Vorticella*, will probably hesitate to deny that they possess some apparatus by which external agencies give rise to localised and co-ordinated movements. And when we reflect that the essential elements of the highest nervous system—the fibrils into which the axis-fibres break up—are filaments of the extremest tenuity, devoid of any definite structural or other characters, and that the nervous system of animals only becomes conspicuous by the gathering together of these filaments into nerve-fibres and nerves, it will be obvious that there are as strong morphological as there are physiological grounds for suspecting that a nervous system may exist very low down in the animal scale, and possibly even in plants.' 'In the highest animals the nervous system is essentially similar to that of the lowest; the difference consisting in part in the proportional size of the nerve-centres and in part in the gathering together of the internuncial filaments into bundles having a definite arrangement which are the *nerves* in the ordinary anatomical sense of the term.' [1]

§ 9. In the *medusæ* there is a nervous ring formed of a cord following the edge of the disk and presenting here and there cellular enlargements. A radiating nervous system seems to exist in the *holothuria*; the *rotifera* have a central ganglionary mass emitting nervous filaments. In the arthropods and the mollusks we discover central nervous masses and a peripheral system connected therewith, including in many cases an ento-peripheral or sympathetic system as well. The higher we proceed in the scale of animal life the more axial the central system becomes and the

[1] *Anatomy of Invertebrated Animals*, Chap. I.

more definitely localised, concentrating itself when we reach the vertebrates in the *spinal marrow* (enclosed in a cavity contained in and extending the length of the vertebral column), and in an encephalic cavity constituting the *brain*; the peripheral system, both epi- and ento-peripheral, extending from these centres all over the body but irregularly as respects the distribution of nerves, which are thickly aggregated in some portions and thinly in others. The rudiments of the brain are observed in mollusks and insects in a *cerebral* or *cerebroidal ganglion* which supplies nerves to organs of special senses and notably to the eye. In the measure that intelligence is greater the cerebral ganglia are in general increased in size and complexity. 'While the rudimentary nervous system consisting of a few threads and minute centres is very much scattered, its increase of relative size and increase of complexity go hand in hand with increased concentration and increased multiplicity and variety of connections.'[1]

§ 10. The exercise of the normal functions of the nervous system depends upon nutrition. The nervous substance is elaborated and renewed from the blood by the assimilative processes in the same general manner as the muscular, the connective, and all the other tissues are formed and maintained. Nervous matter is differentiated from matter in general, and nervous force is a variety of force in general, one of the forces which compose the physical world. The latter is not resolvable into electricity or into any other force. So far as its nature has been ascertained it is *sui generis*. It depends upon animal life, that is to say the exercise of its functions requires vital organisation; on the other hand it controls animal life, for all the organising functions within the body require nerve-force to stimulate their motions. If the supply of this force to the organs of vital action is cut off they cease their action and the animal dies.

§ 11. This brief survey of the nervous system enables us to see both the nature of its offices and the manner of its operation. It is the promoter and regulator of animal motion. This motion is both a motion of the whole body with respect to external bodies and motions of parts of the body with reference to each other. This last embraces both motions of limbs and motions of digestive and assimilative life. Hence the nervous system is primarily an accessory of the introsusceptive system, bearing in mind also that this includes as well functions of repulsion, and

[1] Spencer's *Principles of Psychology*, Vol. I. Chap. I.

secondarily an accessory of all the other systems of organic life in so far as they involve organic motions. It is emphatically and peculiarly the governor of the motor system.

§ 12. It is sufficiently evident that molecular motion transmitted from the periphery to the centre may readily enough meet with a resistance and be reflected to the periphery, there to expend itself in muscular motion; or that a molecular motion arising at the centre from the disturbance or overflow of reservoirs of locked up motion may proceed outward to the periphery and there generate motion of the muscular system outward till some resistance be reached. But the co-ordination of motions for the benefit of the whole organism is much more difficult to understand, and this difficulty is enhanced by our inability to trace the radiations and counter radiations of molecular motion throughout the central system. Co-ordination involves no other nervous actions than resistance to and initiation of molecular motion. Motion is commenced here, it is abated or suppressed there. Motion is always along the line of least resistance, and inasmuch as life is a process of adaptation of the organism to its environment, resistances will diminish along lines of movement which favour such an adaptation and will increase along lines which are opposed to it. Hence channels of molecular motion will be formed which render certain movements inevitable upon a given excitation, and these movements will be such as to favour the evolution and integration of the organism. It is scarcely to be doubted that nervous movements once made always occasion a change of structure of the nervous substance in which they occur, through which the same or a like molecular change is rendered more easy of recurrence. Repetition of experiences and the recurrence of like experiences upon the organism produce the same and like nervous motions in answer; so that habits of nervous action are established by similar impressions from the environment. To impacts from without should be added all the reactions from within, like causes there also producing like effects. In addition, inherited tendencies constitute a powerful factor in determining the directions and extent of nervous waves and currents. So that by the uniformity of nature the action of similar causes through countless ages has built up from the simplest forms of nervous structures with corresponding simplicity of functions a progressive increase in complexity and heterogeneity until we find in man a degree of multiformity and complexity in nervous action which we can symbolise but

are not able actually to describe and trace save very imperfectly.[1]

§ 13. The superposition of consciousness upon animal life enables us to express in terms of conscious mental existence the various actions and reactions of nervous force and to map out their courses, if the inference be correct that all mental experience as we know it is concurrent with and inevitably accompanied by molecular changes in the nervous system. I think we are warranted in making such an induction. The observed effects of the mind upon the body, the light thrown by morbid anatomy upon animal structures and the results of vivisection, all go to prove the truth of this generalisation, and there are no facts scientifically examined which are sufficient to cast a reasonable doubt upon its conclusiveness. How much science will be able to accomplish in the way of exactly noting the physiological changes accompanying the different phases of consciousness and of reducing them to an organised body of knowledge, is, of course, one of the important problems of the future.

§ 14. As was announced at the beginning of this chapter we are now brought up to the threshold of consciousness. The Science of States of Consciousness generalises facts whose obverse sides are facts of nervous action, interaction, and reaction, these last in their turn bearing relation to all the facts of animal life. As we proceed with our study, therefore, we shall all the while be bringing out facts in relation to the nervous and other physical functions and their connections with mental states, but the point has now been reached when we must leave the consideration of material conditions as such and pass on to an examination of the genesis and development of states of consciousness themselves. Before doing this, however, we ought to give a short account of the human organism as the special form of animal life wherewith we find the highest development of mental powers and to which we must look for the greatest portion of the data for our science.

[1] The operation of the nervous system is described and pictured in the most complete manner of which I am cognisant in Herbert Spencer's *Principles of Psychology*, Part I. Chaps. I.–V. inclusive.

CHAPTER XXII.

THE HUMAN ORGANISM.

§ 1. MAN is the most highly evolved of the Vertebrates (Chap. XX. § 42). He belongs to that division of vertebrates termed Mammalia, whose leading characteristic is that its members have mammary glands from which they supply their viviparously produced young with nourishment for a time after birth. The class Mammalia is divisible into the following groups:[1]—

A. There are large and distinct coracoid bones, which articulate with the sternum.

The ureters and the genital ducts open into a cloaca, into which the urinary bladder has a separate opening.

The penis is traversed by a urethral canal, which opens into the cloaca posteriorly and is not continuous with the cystic urethra.

There is no vagina.

The mammary glands have no teats.

I.—Ornithodelphia.

1. Monotremata (Echidna and Ornithorynchus).

B. The coracoid bones are mere processes of the scapula in the adult and do not articulate with the sternum.

The ureters open into the bladder; the genital ducts into a urethra or vagina.

The cystic urethra is continuous with the urethral canal of the penis.

There is a single or a double vagina.

The mammary glands have teats.

A. The embryo does not become connected with the wall of the uterus by an allantoic placenta. The vagina is double.

II. Didelphia.

2. Marsupialia.

B. The embryo has an allantoic placenta. The vagina is single.

III. Monodelphia.

a. Median incisor teeth are never developed in either jaw.

[1] Huxley's *Anatomy of Vertebrated Animals*, Chap. VIII.

3. Edentata (Sloths and Ant-Eaters).

b. Median incisor teeth are almost always developed in one or both jaws.

i. The uterus develops no decidua (non-deciduata).

4. Ungulata (Horses, etc.).
5. Toxodontia (?) (Toxodon, extinct).
6. Sirenia (?) (Dugong and Manatee).
7. Cetacea (Whales, etc.).

ii. The uterus develops a decidua (deciduata).

a. The placenta is zonary.

8. Hydrocoidea (Hyrox).
9. Proboscidea (Elephants, etc.).
10. Carnivora (Dogs, Cats, Seals, etc.).

b. The placenta is discoidal.

11. Rodentia (Squirrels, Rats, etc.).
12. Insectivora (Hedgehogs, Shrews, etc.).
13. Cheiroptera (Bats).
14. Primates (Apes, Man).

By the above schedule the position of Man will be seen to be among the Primates.

The following are the divisions of the Primates:—

a. Lemuridæ (Lemurs).

1. Lemurini.
2. Cheiromyini.

b. Simiadæ (Apes and Monkeys).

3. Arctopithecini (Marmosets).
4. Platyrrhini.
5. Catarrhini.

α. Cynomorpha.

β. Anthropomorpha.

a a. Hylobates (Gibbons).

b b. Pithecus (Orangs).

c c. Troglodytes (Chimpanzee).

d d. Gorilla.

c Anthropoidæ, Man.[1]

[1] Huxley.

GENERAL STRUCTURE: INTROSUSCEPTION; REPULSION.

§ 2. The human organism has a central osseous framework which consists (1) of a central axis constituted by the bodies of the vertebræ; (2) of a series of osseous arcs divided backwards to form by their aggregation a large canal, in which are contained the principal organs of the nervous system; (3) of a series of arcs directed forwards bounding certain cavities which are occupied alone by the organs of vision, smell, and taste—then by the central organs of circulation and the lungs—lower down by the digestive apparatus—and lower still by the organs of reproduction; (4) of the appendages to various segments called extremities, the anterior serving in a general way for prehension, the posterior for locomotion.[1] This framework constitutes the endoskeleton and consists of about one hundred and eighty-eight bones. The office of this framework is to secure a solidity and unity of the body, supporting and enclosing the soft parts, and also to furnish points of resistance for muscular contraction, thus making extensive movements practicable. Overlying this osseous structure and enclosed in its cavities are the organs of assimilation, embracing digestion and circulation, together with all the organs of reproduction and special excretion. Overlying and intermingled with these are the muscles which promote internal functions and which subserve the prehensive and locomotive offices of the organism. Overlying these in turn is an epidermal integument covering the whole except at sundry apertures. Finally there is an exoskeleton in the form of hairs, more abundant on the crown of the head; and usually in the axillæ, the pubic region and the front part of the thorax. In locomotion of the whole body the posture is erect with the head at the top, in equilibrium upon the vertebral column, which with the rest of the body is supported upon the legs and feet, the two arms hanging free at the sides. The cranium is composed of two portions: the cranium proper, which is the receptacle of the brain, and the face, which is the receptacle of the principal organs of sense and of the masticatory apparatus. In man the cranium is large and placed above the face; in quadrupeds it becomes less and recedes more and more backwards. The cranial capacity in man is one of the distinctive

[1] Topinard's *Anthropology*, Chap. I.

features of his structure. In healthy adults it is invariably more than forty cubic inches and sometimes rises to more than a hundred. In the orang and the chimpanzee we have a maximum of twenty-six or twenty-seven cubic inches; in the gorilla about thirty-five, which is the nearest to the human brain. The mean capacity of the highest apes is about one-third that of man. In man the facial angle has a minimum of 56 degrees and in the chimpanzee reaches a maximum of 42 degrees; in the gorilla say 32 degrees, in the bear say 30, in the horse say 24, in the wild boar say 10 degrees. The vertebral column or spine has twenty-four separate bones, or vertebræ, below which comes the sacrum, made up of five consolidated vertebræ, succeeded by the coccyx, consisting of four small tail vertebræ, which in adults also unite to form one bone. The seven vertebræ nearest the skull are the cervical; next to these are twelve dorsal vertebræ, to which the ribs are attached meeting in front in the sternum or breast bone. Below the dorsal are the lumbar vertebræ, which are without rib attachments. The foregoing bones constitute the *axial skeleton*. *The appendicular skeleton* consists of the shoulder girdle with the bones of the fore limbs and the pelvic girdle with the bones of the posterior limbs; the axial skeleton furnishes the support of resistance to impinging movements, the appendicular the support of active movements of the body itself. The fore-limb or arm has thirty bones, the largest lying in the upper arm and called the humerus; at the elbow follow side by side the radius and the ulna; at the lower ends of these bones are packed together eight small ones forming the wrist; then five cylindrical bones called the metacarpal, one for the thumb and one for each finger, succeeded by two bones in the thumb and three in each finger, which are called phalanges. The hind limb or leg has thirty bones, but with one less at the ankle than at the wrist and one at the knee not found at the elbow joint. The thigh bone,—femur—is the largest in the body and extends from the hip to the knee joint. Below are side by side the tibia and fibula; in front of the knee joint is the patella or knee pan. At the lower end of the leg bones comes the foot, consisting of the tarsus, metatarsus and phalanges. The tarsus corresponds with the carpus of the wrist and is made up of seven irregular bones, the largest being the heel bone or calcaneum. The metatarsus has five bones, each having at the distal end a toe; in the toes there are three phalanges, except the great toe, which has two. The arrangement of the bones of

the appendicular skeleton and also their number, shape and size favour a great variety of motions.[1]

§ 3. The bones are articulated at the extremities in many instances, so as to permit the gliding of one bone over another, by ball-and-socket-joints, hinge-joints, pivot-joints, and gliding-joints. The bones are connected with each other by the connective tissues and by cartilages. They are also connected by the muscles, which form the second important division of the introsusceptive-repulsive structure. The muscles are divided into the *skeletal*, or voluntary, and the *visceral*, or involuntary; the latter promoting the movements of the assimilative functions, the former the movements of the introsusceptive. The skeletal muscles have their two ends attached to two different pieces of the skeleton, between which more or less movement is possible. In the great majority of cases a true joint lies between the bones on which the muscle can pull, so that when the latter contracts it produces movement at the joints. Usually that part of the skeleton to which one end of a muscle is fixed is more easily moved than the part on which it pulls by its other tendon. The less movable attachment is called the *origin*, the more movable the *insertion* of the muscles. The action of the muscles upon bones is lever action, and the human body contains all the three forms of levers recognised in mechanics. Some of the muscles belonging to the introsusceptive system are not directly attached to bones, as certain of the facial muscles—those opening the mouth and those closing the eye for example—but nearly all of them are attached at one end or the other to the osseous framework. By means of the osseous and muscular apparatus acting in the manner just indicated all the movements of locomotion and prehension are accomplished.[2]

§ 4. The third important element in self mobility is the nervous system, which directs and stimulates the muscular action. This as before we will reserve to be considered last.

§ 5. The skin operates as a protective covering, as an absorbent, and as an organ of excretion. It consists of two distinct layers: an outer, the *cuticle* or *epidermis*, and a deeper, the *dermis*, *cutis vera*, or *corium*. The former consists of cells arranged in many layers and united by a small amount of cement-

[1] Cf. Huxley's *Anatomy of Vertebrated Animals*; Topinard's *Anthropology*; Huxley and Youmans's *Physiology and Hygiene*; Martin's *The Human Body*.

[2] Cf. same authorities, especially Martin's *The Human Body*.

ing substance; the latter consists of a close network of elastic and white fibrous tissue, which, becoming wider meshed below, passes gradually into the subcutaneous areolar tissue which attaches the skin loosely to the parts beneath. The outer surface of the *cutis vera* is almost everywhere raised into minute elevations called the papillæ, on which the epidermis is moulded, so that its deep side presents pits corresponding to the projections of the dermis. These papillæ contain blood-vessels and also nerve-fibres or their connections. The skin also contains *sudoriparous* or sweat glands and *sebaceous* or oil glands, the former having chiefly an excretory office, while the latter are mainly protective in their functions, lubricating the skin and the hairs.[1]

§ 6. There is one special set of organs which primarily belongs to the introsusceptive-repulsive system, as exhibiting one phase of bodily movements for communication with the environment, to which we will here make reference. 'The *voice* consists of sounds produced by the vibrations of two elastic bands, *the true vocal cords*, which are placed in the larynx, an upper modified portion of the passage which leads from the pharynx to the lungs. When the vocal cords are put in a certain position air driven past them sets them in periodic vibration and they emit a musical note; the lungs and respiratory muscles are therefore accessory parts of the vocal apparatus; the strength of the blast produced by them determines the loudness of the voice. The larynx itself is the essential voice-organ: its size primarily determines the pitch of the voice, which is lower the longer the vocal cords; and hence, shrill in children, and usually higher pitched in women than in men; the male larynx grows rapidly at commencing manhood, causing the change commonly known as the "breaking of the voice." Every voice, while its general pitch is dependent on the length of the vocal cords, has, however, a certain range within limits which determine whether it shall be soprano, mezzo-soprano, alto, tenor, baritone, or bass. This variety is produced by muscles within the larynx which alter the tension of the vocal cords. Those characters of voice which we express by such phrases as harsh, sweet, or sympathetic depend on the structure of the vocal cords of the individual; cords which in vibrating emit only harmonic partial tones are pleasant; while those in which inharmonic partials are conspicuous are disagreeable. The vocal cords alone would produce but feeble sounds; those that

[1] Martin

they emit are strengthened by sympathetic resonance of the air in the pharynx and mouth, the action of which may be compared to that of the sounding-board of a violin. By movements of throat, soft palate, tongue, cheeks, and lips the sounds emitted from the larynx are altered or supplemented in various ways and converted into articulate language or speech.'[1]

§ 7. The organs of special sense are a part of the systems of communication of the organism with its environment, and are thus to be properly classed as organs of introsusception and repulsion. But their features are best considered in close connection with the genesis of sensations, and we will accordingly defer to the next part of this work a special delineation of their characteristics.

ASSIMILATION, EXCRETION, AND REPRODUCTION.

§ 8. Man has thirty-two permanent teeth, which are adapted both for cutting and for crushing food. He has three pairs of salivary glands whose secretions are somewhat different, *inter sese.* He has one stomach, a small intestine and a large intestine coiled in the abdominal cavity, the two being together about twenty-five feet long. His gastric and intestinal secretions and their effects do not differ materially from what has been set forth in the preceding chapter but one (§ 47). The lymphatics bring finally the nutriment into two main trunks which open into the venous system on each side of the neck at the point of junction of the jugular and subclavian. The trunk on the right side is much the smaller and is called the *right lymphatic duct*; the other is called the *thoracic duct* and receives the major part of the lymph. The heart in man is quadrilocular and is enclosed in a loose bag of connective tissue, called the *pericardium.* The wall of the heart itself is chiefly made up of striped muscular tissue, through whose movements the heart-beats are produced. The heart and the two lungs, one on each side of the heart, occupy the principal portion of the thoracic cavity, which is separated from the abdominal by the *diaphragm.* The phenomena of circulation have already been described. Excretion is accomplished through the skin, the large intestine, the kidneys and the bladder, and the lungs. Reproduction is accomplished gamogenetically and viviparously, as in all mammalia. The zoosperms of mankind are about $0^{mm}{\cdot}04$ ($\frac{1}{500}$ inch) in length. The seminal fluid is an

[1] Martin's *The Human Body*, Chap. XXXVI.

albuminous liquid containing granules and zoosperms. The ovum is discharged from the ovary into the uterus at periodical intervals of about a lunar month. Pregnancy lasts about 275 days. Lactation lasts nearly a year after birth of the child. Impregnation takes place normally by intromission of the penis within the female vagina and the discharge there of the male seminal fluid whose spermatozoa find their way into the uterus and are brought into contact with the ovum.[1]

MEDIA.

§ 9. The blood consists of plasma, mainly water containing in solution serum albumin, sodium salts, smaller amounts of those of other metals and extractives, of which the most important are urea, creatin, and grape sugar; red corpuscles containing rather more than half their weight of water, the remainder being mainly hæmoglobin, other proteids, and potash salts; white corpuscles consisting of water, various proteids, glycogen and potash salts; gases partly dissolved in the plasma or combined with its sodium salts, and (oxygen) partly combined with the hæmoglobin of the red corpuscles. The specific gravity of the blood is on the average 1055. The total amount is about $\frac{1}{13}$ of the whole weight of the body, so the quantity in a man weighing 75 kilos (165 lbs.) is about 5·8 kilos (12·7 lbs.). Of this at any moment about one-fourth would be found in the heart and large blood-vessels; and equal quantities in the capillaries of the liver and in those of the muscles which move the skeleton; while the remaining fourth is distributed among the remaining parts. The lymph is the blood minus red corpuscles and considerably diluted, containing also minute quantities of substances derived from neighbouring tissues. It contains also a considerable quantity of carbon dioxide gas.

§ 10. The body loses about eight pounds (4 kilogr.) of matter daily by exhalatory and excretory processes. This continual waste must be supplied by aliment. With this consumption of matter is the liberation of a large amount of kinetic force; this must also be supplied from the materials introduced. The aliment then must supply material for the maintenance and growth of the tissues and for the generation of the forces requisite to carry on all the organic functions. The alimentary principles may be classed as Proteids, Albuminoids, Hydrocarbons, Carbohydrates, or

[1] Martin

Amyloids, and Inorganic Bodies. The proteids are composed of carbon, hydrogen, oxygen, azote, and sulphur. They are obtained from both animals and plants. The chief are myosin and syntonin found in the lean of all meats, egg albumen, casein, gluten, and vegetable casein. The composition of the albuminoids is effected from the same elements as the proteids, except that sulphur is rarely found. They are not able wholly to replace proteids as foods though supplementing them. Gelatin is the most important, which is yielded by the white fibrous tissue of animals when cooked. The hydrocarbons are fats and oils and do not contain azote; the oxygen is present in small proportion as compared with the hydrogen. In the amyloids there is one atom of oxygen for every two of hydrogen. The latter comprise starch, dextrin, gums, and sugar; they are mainly of vegetable origin, sugar of milk and glycogen, however, being derived from animals. The inorganic bodies of alimentary use are chiefly water and various salts, and mineral principles.

§ 11. Aliment is taken into the organism chiefly in the form of water, flesh, eggs, milk, and vegetables. Flesh contains proteids, especially myosin; gelatin yielding matters in the white fibrous tissue; stearin, palmatin, margarin, and olein, among the fats; a small amount of amyloids in the form of glycogen and grape sugar; also inosite, a kind of sugar found only in muscles. Flesh also contains much water and a considerable number of salines, especially potassium phosphate. Eggs contain a large amount of egg albumen and also fats. Milk contains casein, several fats in the butter, an amyloid, milk sugar, much water, and salts, especially potassium and calcium phosphates. The best vegetable food is wheat. This contains in 1000 parts, 135 of proteids, 568 of starch, 46 of dextrin (an amyloid), 49 of grape sugar, 19 of fats, 32 of cellulose, and the remainder of water and salts. The proteid of wheat is gluten. Some other cereals have a larger proportion of starch but none have so great an abundance of proteid food. Fresh vegetables and fruits are mainly valuable for their salts. The needs of the human organism are hence supplied best by a mixed diet, azote being derived from the proteids, and carbon mainly from the hydrocarbons and the amyloids. Hydrogen is also derived from these foods as well as from water; oxygen likewise from foods and water, though mainly received from the air and taken into the lungs. The various food materials have frequently need of special preparation by way of cooking before

being taken into the stomach; and having once been introduced into the body they go through all the modifications induced by the digestive processes ere they are taken up into the structure itself. Before reaching their ultimate destination they are sometimes stored up for awhile, the liver operating as a storehouse of glycogen and the adipose tissue of fatty matters, both of which are held in reserve against a failure of introsusceptive supply.

The temperature of the human body is 36 to 37° C.[1]

THE NERVOUS SYSTEM.

§ 12. The central nervous system in man embraces the *cerebro-spinal axis* and the *sympathetic centres*. Sporadic ganglia may have central functions, but we do not yet know that they have. The cerebro-spinal axis includes the *Encephalon* or *Brain* and the *Spinal Cord*, which are united and continuous from the head through the *foramen magnum* of the occipital bone and through the cavities of the vertebræ and terminating between the first and second lumbar vertebræ in a slender filament, the *filum terminale* which runs to the end of the neural canal behind the sacrum. This axis is bilaterally symmetrical throughout; the nerve-substance is enveloped in three membranes: the *external*, or *dura mater*, the *medial*, or *arachnoid*, and the *internal*, or *pia mater*. The *dura mater* is a very tough and strong membrane composed of white fibrous and elastic connective tissues; in the skull it adheres by the outer surface to the cranial bones forming also their periosteum; in the vertebral column it is only attached here and there to the bones which have a separate periosteum. The *arachnoid* membrane has two layers containing between them a watery fluid called the *cerebro-spinal fluid*; the membrane is composed of flat, closely fitting cells. The *pia mater* is of similar material to the *dura* but with fibres woven less closely so as to make a less dense and tough membrane. It contains many blood vessels which after breaking up into minute branches pass into the nervous matter beneath.[2]

§ 13. The Brain is an aggregate of mixed grey and white nerve matter and is divided into various distinct parts. The average weight of the brain in the adult male is about 50 ounces, the female adult brain being about 5·5 ounces less. The brain is divided into the *Fore-Brain*, *Mid-Brain* and *Hind-Brain*. The

[1] The foregoing three sections are chiefly collated from Martin's *Human Body*.
[2] Martin.

fore-brain comprises the *Cerebrum*, the *Olfactory Lobes*, the *Corpora Striata* and the *Optici Thalami*. The mid-brain includes the *Corpora Quadrigemina* and the *Crura Cerebri*. The hind-

FIG 1. GENERAL VIEW OF THE NERVOUS SYSTEM.

brain comprises the *Cerebellum*, the *Pons Varolii*, and the *Medulla Oblongata*. The cerebrum is the highest and largest portion of the brain. It is egg-shaped, but flattened on the

under side. It consists of two large convoluted hemispheres separated in a great part of their extent by a fissure termed the great longitudinal fissure. The olfactory lobes are located one beneath each cerebral hemisphere and are small bodies of no conspicuous character in the human brain. The corpora striata are two large ovoid masses of grey matter the greater part of which is imbedded in the middle of the white substance of the hemisphere of the brain. At some depth from the surface of the corpus striatum white fibres cut into it which are prolonged from the corresponding cerebral peduncle and give it a streaked appearance. The optici thalami are of an oval shape and rest upon the corresponding cerebral crura, which they in a manner embrace. On the outer side each thalamus is bounded by the corpus striatum and is there continuous with the white substance of the hemisphere; the inner side of the two thalami are turned to each other. The corpora quadrigemina are four rounded eminences separated by a crucial depression, placed two on each side of the middle line, one before the other. They are connected with the back of the optici thalami and with the cerebral peduncles on either side. The upper or anterior corpora are somewhat larger and darker in colour than the posterior. In the adult both pairs are solid and are composed of white substance outside containing grey matter within. They receive bands of white fibres from below. A white cord also passes up on each side from the cerebellum to the *corpora* and is continued onward to the thalami; these two white cords are the superior peduncles of the cerebellum. At each side the corpora quadrigemina send off two white tracts which pass to the thalami and to the commencement of the optic nerves. The crura cerebri are two broad diverging bundles of fibres lying below the corpora quadrigemina. The cerebellum consists of a body and three pairs of crura or peduncles. The superior crura connect the cerebellum with the cerebrum through the corpora quadrigemina. The inferior crura pass downward to the back part of the medulla oblongata. The middle crura pass from the middle of the cerebellum around the outer side of the crura of the cerebrum and meet in front of the pons Varolii, constituting its transverse fibres. They connect the two halves of the cerebellum below. The body of the cerebellum consists of two lateral hemispheres joined together by a median portion called the vermiform process. Its greatest diameter is transverse; it is about three and a half or four inches

wide, about two or two and a half from before backwards and about two inches deep in the thickest part, but is much thinner all around its outer border. The body of the cerebellum at the surface and for some depth consists of numerous nearly parallel laminæ or foliæ; they are not convoluted but are separated by fissures (*sulci*) of different depths. The pons Varolii is situated below and behind the crura cerebri and between the middle crura of the cerebellum and above and in front of the medulla oblongata. It consists of transverse and longitudinal white fibres interspersed with a quantity of diffused grey matter. The transverse fibres with a few exceptions enter the cerebellum as its middle crura and form a connecting system for its two hemispheres. The longitudinal fibres are those which ascend from the medulla oblongata into the crura cerebri, augmented, it would seem, by others which arise within the pons from the grey matter scattered through it. The medulla oblongata is an expansion of the spinal cord, continuous with it, but lying wholly within the cranial cavity. Its upper end passes into the pons Varolii. It is of pyramidal form, having its broad extremity turned upwards, from which it tapers to its point of union with the spinal cord; it is expanded laterally at its upper part. Its length is about an inch and a quarter; its greatest breadth about three quarters of an inch and its thickness about half an inch.[1]

§ 14. The foregoing divisions of the brain include its most salient and important parts. These, however, do not fill the whole cranial space. Between the *corpus callosum* above and the crura below, the two hemispheres of the cerebrum are partially separated from each other so as to leave an interval, the general ventricular space. This is divided so as to form five separate ventricles. The ventricles contain a small amount of cerebro-spinal liquid and are lined with epithelium which in early life becomes ciliated. There are also smaller parts, as the pineal and pituitary glands, which have no special physiological importance.

§ 15. The brain, as already shown, contains both cells and fibres, the former being represented by the grey substance and the latter for the most part by the white. By far the largest amount of grey matter is situated upon the convoluted surface of the cerebrum and the laminated surface of the cerebellum. In the crura cerebri the grey matter is collected into a dark mass in the interior; the same is true of the pons Varolii and the medulla

[1] Martin's *Human Body*; Quain's *Anatomy*.

S 2

and also of the corpora quadrigemina. The corpora striata are masses of grey matter streaked with white. The cerebrum has its interior made up of white substance; so also the cerebellum: but the medulla and other parts just mentioned have their surfaces of white matter.[1]

§ 16. The subsequent diagrams will exhibit the relations of the different parts of the brain with each other and with the remainder of the nervous system.

FIG. 2. RIGHT HALF OF THE BRAIN DIVIDED BY A VERTICAL ANTERO-POSTERIOR SECTION (from various sources and from nature). (Allen Thomson.)

1, 2, 3, 3a, 3b, are placed on convolutions of the cerebrum; 4, the fifth ventricle, and above it the divided corpus callosum; 5, the third ventricle; 5', pituitary body; 6, corpora quadrigemina and pineal gland; +, the fourth ventricle; 7, pons Varolii; 8, medulla oblongata; 9, cerebellum; I, the olfactory bulb; II, the right optic nerve; III, right third nerve.

§ 17. The spinal cord consists of a column of white fibrous matter with a grey portion enclosed. Its average diameter is about 19 mm. ($\frac{3}{4}$ inch) and its length 0·43 m. (17 inches). It weighs 42·5 grams ($1\frac{1}{2}$ ounce).

The spinal cord is somewhat cylindrical in form, but is flattened from before backward. It presents two enlargements, called the cervical enlargement and the lumbar enlargement, which correspond with the large nerves, emanating from these portions, to be distributed to the upper and the lower limbs.

[1] Martin; Quain.

The spinal cord is divided by the anterior and the posterior median fissures into two symmetrical halves; and these are each subdivided into three columns, *the anterior, the lateral, and the posterior columns*, by the anterior and the posterior lateral fissures. The spinal nerves originate from each side of the cord, by anterior and posterior roots, which rise from the corresponding lateral fissures.

FIG. 8. BASE OF THE BRAIN WITH THE ORIGINS OF THE CEREBRAL NERVES (Allen Thomson).

This figure is taken from an adult male brain which had been hardened in alcohol.
1, superior longitudinal fissure; 2, the olfactory tract and sulcus; 2', orbital convolutions; 2'', inferior frontal convolution; 3, 3, 3, fissure of Sylvius; 4, 4, 4, temporo-sphenoidal lobe; 5, 5', occipital lobe; 6, on the right anterior pyramid of the medulla oblongata above the decussation; 7, amygdaloid lobe of the cerebellum; 8, biventral lobe; 9, slender lobe; 10, posterior inferior lobe; +, the inferior vermiform process; I, olfactory bulb; I', the tract divided on the left side; II, in the anterior perforated spot marks the right optic nerve, the left has been cut short; III, on the right crus cerebri, denotes the third nerve; IV, the fourth nerve; V, the fifth; VI, on the pons Varolii, the sixth; VII, also on the pons Varolii, the facial with the auditory nerve on its outer side; XI, on the cerebellum below the flocculus, indicates the spinal accessory nerve; between it and the auditory are seen the glosso-pharyngeal and the vagus; XII, on the upper part of the left amygdaloid lobe, denotes the hypoglossal nerve; C', on the same, the suboccipital nerve.

§ 18. The centres of the sympathetic system next in order demand attention: but merely mentioning them we will leave them for consideration with the remainder of the sympathetic nervous apparatus. Connected with the cerebro-spinal centres

are the nerves which in all their ramifications make up the peripheral system. Some of these make their connections with the brain and some of them with the spinal cord.

The Cranial nerves, or nerves originating in the brain, consist of twelve pairs, named from before backward.

The Olfactory, or first pair of nerves, are situated beneath the anterior lobes of the cerebrum, and are distributed to the mucous membrane of the upper part of the nose. They are *nerves of smell.*

The Optic, or second pair of nerves, diverge from the optic commissure, and pass into the orbits, where they are distributed to the retina of the eyeball. They are *nerves of vision.*

The Oculo-motor, or third pair of nerves, originate from between the crura of the cerebrum and in front of the pons, and are distributed to the muscles moving the eyeball. They are *motor nerves.*

The Pathetic, or fourth pair of nerves, originate from behind the quadrigeminal bodies, and are distributed to the superior oblique muscle of the eye. They are *motor nerves.*

The Trigeminal, or fifth pair, have two roots, like the spinal nerves, and one of these roots has a ganglion, beyond which proceeds a common trunk, which divides into three branches: (1st) *The Ophthalmic nerve*, distributed to the lachrymal gland, the skin and muscles of the forehead, the iris, the eyelids, and the skin of the nose; (2nd) *The Superior Maxillary nerve*, distributed to the cheeks, the nose and upper lip, the upper teeth, the mouth, and the pharynx; (3rd) A branch which unites with the small root of the trifacial nerve, and forms the *Inferior Maxillary nerve*, which is divided into two branches, one going to the muscles that move the jaw, and the other to the external ear, the tongue, the lower teeth, the chin, and the lower lip. The large root is *sensitive*, and also the *nerve of taste*; and the small root is *motor.*

The Abducent, or sixth pair of nerves, arise between the pons and the medulla oblongata in front, and are distributed to the external straight muscles of the orbits. They are *motor nerves.*

The Facial, or seventh pair of nervés, arise between the pons and the medulla oblongata at the sides, and are distributed to the muscles of the ear, the upper part of the neck, and to the temples, cheeks, forehead, eyelids, nose, lips, and chin. These are *motor nerves*, and they produce all the emotional changes in the expressions of the face.

The Auditory, or eighth pair of nerves, originate from the sides of the medulla oblongata, and are distributed to the labyrinth of the ear. They are *nerves of hearing.*

The Glossopharyngeal, or ninth pair of nerves, arise by five or six roots from each side of the medulla oblongata, and are distributed to the lining membrane of the internal ear, the tonsils, the muscles, and mucous membrane of the pharynx, and the root of the tongue. They are *sensitive nerves*, and also *nerves of taste.*

The Pneumogastric, or tenth pair of nerves, arise by from ten to fifteen roots from each side of the medulla oblongata, descend through the neck and thorax, and are distributed to the larynx,

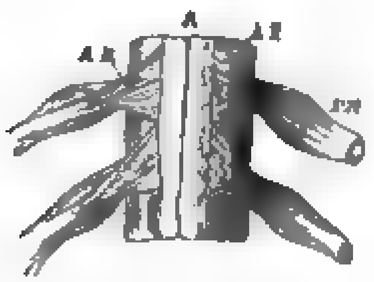

FIG. 4.

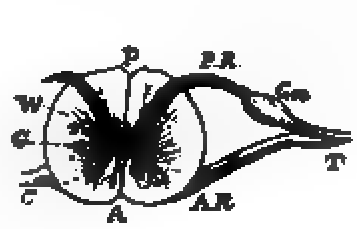

FIG. 6.

THE SPINAL CORD.

Fig. 4.—A front view of a portion of the cord. On the right side, the anterior roots, *A.R.*, are entire; on the left side they are cut, to show the posterior roots, *P.R*

Fig. 5.—A transverse section of the cord. *A.* the anterior fissure, *P.* the posteriot fissure; *G*, the central canal; *C*, the grey matter; *W*, the white matter; *A.R.*, the anterior root, *P.R.*, the posterior root, *Gn.*, the ganglion, and *T.*, the trunk, of a spiual nerve.[1]

the trachea, the lungs, the heart, the pharynx, the œsophagus, and the stomach. They are *sensitive nerves.*

The Accessory, or eleventh pair of nerves, arise by several roots from the spinal cord, and the upper parts of the medulla oblongata, and are distributed to the larynx, and to the muscles of the neck, and the upper back part of the chest. They are *motor nerves*, and preside over the vocal movements of the glottis.

The Hypoglossal, or twelfth pair of nerves, arise from each side of the medulla oblongata, and are distributed to the muscles of the tongue. They are the *motor nerves* of the tongue.[2]

§ 19. Thirty-one pairs of spinal nerve trunks enter the neural canal of the vertebral column; of these 8 are cervical, 12 dorsal, 5 lumbar, 5 sacral and 1 coccygeal. The details of the different parts of the body to which they run and from which they proceed are unnecessary for the purposes of this work. The entrance of each nerve trunk through the foramina between the vertebræ by two roots has already been noted. The posterior root has a small

[1] Martindale. [2] Martindale's *Anatomy*, etc.

ganglion which is the only particular in which its appearance differs from that of the other root. The distribution of the nerves is shown in the general view of the nervous system given in fig. 1, p. 260.

§ 20. The sympathetic system consists of a double chain of very small ganglia, which extend from one end of the body to the other, in front of the spinal column, running through the deeper parts of the neck, and enclosed in the cavities of the chest and abdomen. The successive ganglia are connected with each other by fine nervous fibres, which run upward and downward in the direction of the chain. From the ganglia there are also given off numerous interlacing nerves, which are distributed to the great internal organs of the body—to the heart, the lungs, the stomach, the pancreas, the liver, the intestine, and the kidneys. These nerves are smaller than those of the cerebro-spinal system, and are less distinctly visible, owing to their greyish colour and greater delicacy of texture.

A striking peculiarity in the course of the nerves belonging to the sympathetic system is that they follow closely the distribution of the blood-vessels. Starting from the heart, they envelop the great vessels with a sort of network, or plexus, of fine interlacing nerves, which is called the *Arterial Plexus* of the sympathetic nerves. Each plexus is reinforced by fibres from the adjacent ganglia, and sends off corresponding divisions with the arterial branches, which follow their successive ramifications, and thus accompany them all over the body, and penetrate with them into the substance of all the organs.

In the neck and in the chest the sympathetic ganglia are regularly arranged in pairs, one on each side of the body, in front of the spinal column. This regularity is especially marked in the chest, where the ganglia are twelve in number, each one resting upon the head of the corresponding rib. But in the upper part of the abdomen their arrangement is different. Immediately behind the stomach, and about the great vessels given off from the aorta at this part, there is a collection of sympathetic ganglia varying in form and size. Of these ganglia there is one on each side, which is larger than the rest, and which, from its semicircular or half-moon shape, is called the *Semilunar ganglion*. All the ganglia are united with each other and those of the opposite side by a network of filaments, forming a close and intricate central plexus.

From this plexus other bundles of interlacing filaments are given off, which follow the course of the blood-vessels to all the abdominal organs. It has therefore received the name of the *Solar plexus*, because the other abdominal plexuses radiate from

FIG. 6.—COURSE AND DISTRIBUTION OF THE GREAT SYMPATHETIC.

it in every direction like the rays diverging from the sun. Thus the solar plexus holds, as it were, the central place in the nervous system of the abdomen, and by its radiating filaments controls the action of the various organs contained in the abdominal cavity.

Here, also, as in other parts of the body, the sympathetic plexuses and their branches follow the course of the blood-vessels, embracing them everywhere with a network of intersecting fibres. Each sympathetic ganglion is united by communicating branches with the neighbouring spinal nerves and near the skull with various cranial nerves also; so that the connections with the cerebro-spinal system are very close.[1]

§ 21. We have now to give an exposition of the functional offices of the human nervous system. The division of nerves into *afferent* and *efferent* has been remarked; and also the combination of nerves into trunks before reaching the centres from the periphery. The great majority of the larger nerve trunks contain both afferent and efferent nerve-fibres. As the trunks break up, proceeding toward the periphery, it is found that there is a mixture of afferent and efferent nerves very close to the end of the branches; but before actually reaching a terminus there is a separation, so that the terminus is distinctively afferent or efferent. Proceeding the other way, as the nerve trunk nears the centre, if it be the spinal cord, at the point of separation into roots the afferent fibres all pass into the cord by the posterior or dorsal root, while the efferent enter by the anterior or ventral root. The cranial nerves, with the exception of the trigeminal, do not have distinct afferent and efferent roots; at their origin from the brain most of them are purely afferent or efferent, and the mixed character which their trunks exhibit is due to cross branches with neighbouring nerves. The olfactory, optic, and auditory nerves remain purely afferent; the others are more or less mixed. The nerves convey to and from the centres molecular motion at the rate of about 33 metres (108·24 feet) per second. The afferent motions excite movements of the centres which we shall subsequently describe. The efferent motions excite various movements, according to the nature of their termini; those nerves terminating in muscles are termed characteristically *motor* nerves; those distributed to the muscles of the blood-vessels are termed *vaso-motor* nerves; those distributed to the organs of secretion and stimulating their activity are often spoken of as *secretory* nerves; while those which are supposed to govern the nutrition of the various tissues are sometimes denominated *trophic.* There is great danger, however, in such classifications of nerves that we shall come to regard particular nerves as having some special property of manifesting a particular

[1] Dalton's *Physiology and Hygiene.*

kind of nerve force, whereas the evidence thus far points to the conclusion that nerve force is always one and the same, and the differences in its effects are solely attributable to differences of terminal connection. The best general division of nerves aside from *afferent* and *efferent*, is into *epi-peripheral*, *ento-peripheral*, and *inter-central*.[1]

§ 22. The nerve-centres are either *Reflex* or *Self-Active* (*Automatic*), or both. The reflex centres are those which act only upon an afferent impulse which they reflect in the form of an efferent impulse. The self-active centres are those which act of their own force without the traceable stimulus of afferent motion. There is nothing to indicate any difference in kind between these two classes of centres, nor does there seem to be anything to show that the same centre may not be both reflex and self-active. Still the fact remains that one portion of nerve-centres is characteristically reflex in function, while another group is prominently self-active. The principal region of reflex centres is the spinal cord; of self-active centres, the brain. The brain, however, has reflex centres as well as self-active; but there is doubt whether the spinal cord has any purely self-active centres.

§ 23. The action of centres is sometimes *augmentative* and sometimes *inhibitory*. During the passage of an impulse along a nerve fibre there is not as a rule an increase or diminution of energy. But in passing through a nerve cell there usually is a very noticeable increase. When afferent impulses reach a centre already in action, the activity of that centre may according to circumstances be augmented or depressed. Similarly, action sent out from the centres may result sometimes in an augmentation of motor effects and sometimes in an inhibition or repression of them. This augmentation and inhibition may be seen both in self-activity and in reflex action.

§ 24. The grey matter of the spinal cord is a collection or series of reflex centres. It seems likely that there are self-active centres as well, but we have not as yet sufficient knowledge on the subject to declare positively. In addition to its central office, the spinal cord is a conductor of nervous motion between the nerves and between more remote portions of the cord and the brain. The main tracks of communication lie in the white columns. Nerve roots enter the grey matter and from the grey matter medullated fibres pass out into a white column and continue to

[1] Cf. Martin's *The Human Body*; Foster's *A Text-book of Physiology*.

the brain by a definitely marked path leading to a brain centre or centres. These paths lie mainly in the lateral columns, the afferent impulses tending to spread into the posterior columns and the efferent into the anterior; the main bulk of the posterior and anterior columns seems to be made up of commissural fibres joining different levels of the cord. The afferent fibres for the most part cross soon after they enter the grey matter and proceed onward, mainly on the side opposite to that of the nerve root which conveyed them to the cord, while the efferent cross mainly in the medulla before they reach the cord; but the crossing seems in neither case to be complete.[1]

§ 25. The medulla oblongata contains the paths of nervous communication between the brain and spinal cord. It also contains centres which are prominently related to the nutritive processes. The chief of these are: (1) The respiratory centre with its neighbouring convulsive centre; (2) The vaso-motor centre; (3) The cardio-inhibitory centre; (4) The centre for deglutition; (5) The centre for the movements of the œsophagus and stomach with an allied vomiting centre; (6) The centre for the reflex excitation of saliva when afferent nerves are stimulated; (7) The diabetic centre. There are also centres for the co-ordination of complex movements.[2] The crura cerebri serve as the great means of communication between the spinal cord and the higher parts of the brain, and with the pons Varolii have an important central functional value in the co-ordination of movements, especially those concerned in the maintenance of equilibrium. The cerebellum is the chief organ of combined muscular movements. Flourens showed that when a small portion of the cerebellum of a pigeon was removed its gait became unsteady; when larger portions were taken away its movements became much more disorderly, and when the whole of the organ was removed there occurred an almost total loss of co-ordinating power. Similar experiments have yielded similar results. With the removal of or injury to the cerebellum there seems to be an impairing of the co-ordinating faculties, though the power to execute movements still remains.[3]

§ 26. 'The functions of the cerebral convolutions are eminently psychical in nature; these parts of the brain intervene, and so far as we can judge intervene only, in those operations of the nervous system in which an intelligent consciousness and

[1] Martin. [2] Cf. Martin; Foster. [3] Foster; Martin.

volition play a part.'[1] 'Cutting or pricking the hemispheres is not attended with either sensation cr movement. Pressure from above downwards, or concussion, produces stupor. When the hemispheres are removed, the following results are observed:— First, the two higher senses sight and hearing are lost. Secondly, memory and all the powers characteristic of intellect or thought are abolished. Thirdly, volition in the shape of purpose and forethought is extinguished. This is involved in the loss of intelligence. An animal cannot proceed in the search for food without ideas of what it wants and a recollection of the means and instrumentality of procedure. Fourthly, there is still a power of accomplishing many connected movements. An animal may walk, swim, or fly, but there is no tendency to begin these actions. Fifthly, there remains an inferior form of the sensibility of the three lower senses—touch, taste, and smell. By stimuli applied to these senses reflex movements may be excited. Thus the hemispheres are not the exclusive seat of consciousness, but they are doubtless the seat both of intelligence and of nearly all the innumerable shades and varieties of sensation and emotion. The attempt to localise the mental functions in special portions of the cerebral mass has been thwarted by observations of a remarkable kind. The phrenologists noticed cases where the destruction or disease of one hemisphere was unaccompanied with the entire loss of any function; the inference being that the hemispheres were duplicate bodies performing the same office, like the two eyes or the two halves of the nostrils. But cases have been recorded of disease of large portions of the brain in both hemispheres at once without apparent loss of function; which would require us to extend still farther the supposition of a plurality of nervous tracks for a single mental aptitude.'[2]

§ 27. Though much more might be said upon the subjects of both the anatomy and physiology of the human nervous system, what remains is so closely connected with pyschological facts and so dependent upon the latter even for full exposition, that we will bring to an end here our general survey of the nerological data of our science as lying within the department of biology. A nervous system of the general character we have observed is, so far as our knowledge goes, conditional for states of consciousness. How in connection with such a nervous system consciousness takes its rise and is developed is a matter for science distinctively

[1] Foster. [2] Bain's *Senses and Intellect*, Chap. II.

psychological, and its proper treatment requires the aid of introspection.

§ 28. 'Starting from the ovum each human life apart from accident and disease runs through a life cycle which terminates on the average after a course of from 75 to 80 years. The earliest years are marked not only by rapid growth but by differentiating growth or development; then comes a more stationary period and finally one of degeneration. The life of various tissues and of many organs is not, however, co-extensive with that of the individual. During life all the formed elements of the body are constantly being broken down and removed; either molecularly (*i. e.* bit by bit while the general size and form of the cell or fibre remains unaltered) or in mass, as when hairs and cuticle are shed. The life of many organs, also, does not extend from birth to death at least in a functionally active state. . . . . . During early life the body increases in mass, at first very rapidly and then more slowly till the full size is attained, except that girls make a sudden advance in that respect at puberty. Henceforth the woman's weight (excluding cases of accumulation of non-working adipose tissue) remains about the same until the climacteric. After that there is often an increase of weight for several years; a man's weight usually slowly increases until forty. As old age comes on a general decline sets in, the rib-cartilages become calcified and lime salts are laid down in the arterial walls which thus lose their elasticity; the refracting media of the eye become more or less opaque; the physiological irritability of the sense-organs in general diminishes; and fatty degeneration, diminishing their working power, occurs in many tissues. In the brain we find signs of less plasticity; the youth in whom few lines of least resistance have been firmly established is ready to accept novelties and form new associations of ideas; but the longer he lives, the more difficult does this become to him. . . . . . After the prime of life the tissues dwindle (or at least the most important ones) as they increased in childhood; it is conceivable that without death this process might occur until the body was reduced to its original microscopic dimensions. Before any great diminution takes place, however, a breakdown occurs somewhere, the enfeebled community of organs and tissues forming the man is unable to meet the contingencies of life, and death supervenes. . . . . . The actual moment of death is hard to define; that of the body generally, of the mass as a whole, may be taken to be the mo-

ment when the heart makes its last beat; arterial pressure then falls irretrievably, the capillary circulation ceases and the tissues no longer nourished from the blood gradually die, not all at one instant, but one after another, according as their individual respiratory or other needs are great or little.'[1]

§ 29. To summarise what has been set forth before, we have the following tabular statement of the different functional and structural departments of the human organism.

Introsusception and Repulsion.

- The Absorptive System (The Skin).
- The Motor System.
  - The Muscular System (The Muscles).
  - The Osseous System (The Bones).
  - The Respiratory System (The Respiratory Apparatus).
  - The Nervous System (The Nerves and Centres).

Expulsion.

- The Exhalatory System (The Skin and Respiratory Organs).
- The Excretory System (The Skin, the Intestines and the Urinary Organs).

Assimilation and Disassimilation.

- The Digestive System (Alimentary Canal).
- The Secretory System (Secretions).
- The Circulatory System (Blood and Lymph Circulation).

Reproduction.

- The Reproductive System.

§ 30. The different races of mankind are divisible into two primary divisions: the *Ulotrichi*, with crisp or woolly hair, and the *Leiotrichi*, with smooth hair.

The Ulotrichi vary in colour from yellow brown to the darkest hue known among men. The hair and eyes are normally dark, and with only a few exceptions (among the Andamanese) they are *dolicocephali*, or people whose cephalic index is lower than 80. The cephalic index is the number which expresses the proportion of the transverse to the longitudinal diameter of the brain case,

[1] Martin's *Human Body*, Conclusion.

the latter being taken as 100 and the former varying from 98 or 99 to 62. The Negroes and Bushmen of ultra-Saharal Africa and the Negritos of the Malay peninsula and archipelago and of the Papuan Islands belong to this *Negroid* stock.

The Leiotrichi are divisible into:—

1. The *Australioid* group, with dark skin, hair, and eyes, wavy black hair and eminently long prognathous skulls (with large cranio-facial angle) and with well-developed brow-ridges; they are found in Australia and the Dekhan.

2. The *Mongoloid* group, with for the most part yellowish-brown or reddish-brown skins and dark eyes, the hair being long, black, and straight. Their skulls range between the extremes of dolicocephaly and brachycephaly (80 and above). They include the Mongol, Thibetan, Chinese, Polynesian, Esquimaux, and American races.

3. The *Xanthochroic* group, with pale skins, blue eyes, and abundant fair hair. Their skulls also range between the extremes of dolicocephaly and brachycephaly. The Slavonians, Teutons, Scandinavians, and the fair Celtic-speaking people are the chief representatives of this division; but they extend into North Africa and Western Asia.

4. The *Melanochroic* group, or dark whites, pale-complexioned people with dark hair and eyes and generally long but sometimes broad skulls. They include the Iberians and 'black Celts' of western Europe and the dark-complexioned white people of the shores of the Mediterranean, Western Asia, and Persia. Professor Huxley thinks the Melanochroi are not a distinct group but result from a mixture of Australioids and Xanthochroi.[1]

[1] The above, with some differences of arrangement, will be found at the conclusion of Huxley's *Anatomy of the Vertebrated Animals*.

Part IV.

THE GENESIS OF STATES OF CONSCIOUSNESS.

'Now when the Creator had framed the soul according to His will, He formed within the mind the corporeal universe and brought them together and united them centre to centre. The soul interfused everywhere from the centre to the circumference of heaven, of which she is the external development, herself turning in herself, began a divine beginning of never-ceasing and rational life enduring through all time.'—Plato's *Timæus*, Jowett's trans.

When?

'Where wast thou when I laid the foundations of the earth? declare, if thou hast understanding. Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it? Whereupon are the foundations thereof fastened? or who laid the corner-stone thereof; when the morning stars sang together, and all the sons of God shouted for joy? . . . . Then Job answered the Lord, and said . . . . What shall I answer thee? I will lay mine hand upon my mouth.'—Job, ch. 38, 40.

How?

'External objects impressed upon the senses occasion first on the nerves on which they are impressed and then on the brain vibrations of the small and as we may say infinitesimal medullary particles.' 'The . medullary substance of the brain is also the immediate instrument by which ideas are presented to the mind; or, in other words, whatever changes are made in this substance, corresponding changes are made in our ideas and *vice versâ*.'—Hartley's *Observations on Man*.

'All sensation has for its condition and starting-point a contact whether in the centre of the organism between cells and groups of cells or at the periphery between the organs of the senses and objects exterior to the organism. Hence the very fact of sensation involves at once the simultaneous existence of a sentient subject and of a medium perceived by it; in short of man and the universe—two inseparably associated realities.'—Lefèvre's *Philosophy*, Part II. Chap. III.

CHAPTER XXIII.

REFLEX ACTION WITHOUT CONSCIOUSNESS.

§ 1. ALTHOUGH consciousness is, so far as we know, always attended with nervous action, not all nervous action is attended with consciousness. All that class of movements which in the last two chapters were described as *Reflex* may take place without consciousness, though accompanied frequently by other nervous actions which develop consciousness. A considerable degree of perfection of animal movements may be attained, therefore, without the presence of consciousness.

§ 2. Reflex action for the most part is not to be regarded as taking place without the co-operation of centres by the mere transfer of the same current from an afferent to an efferent nerve. It is true, however, that the end of an afferent nerve may be united with the end of a motor nerve, and when the union is complete, excitation of the sensory may be transmitted to the motor fibres. This was accomplished experimentally by uniting the central end of the cut lingual nerve, the afferent nerve of the tongue with the peripheral end of the cut hypoglossal, the motor nerve of the tongue. The natural course of a stimulus is upward in the lingual and downward in the hypoglossal; but after the union had taken place, stimulation of the central part of the lingual produced contractions of the tongue such as naturally follow stimulation of the hypoglossal; while, inversely, stimulation of the peripheral end of the hypoglossal produced evidence of pain.[1] Moreover if the end of a rat's tail be grafted into the skin of its back and when the graft is completed if the tail be cut through at its base, the animal will at the end of some months feel a pinch of the grafted tail and turn round to bite.[2] But normally it is found that the process of reflex transfer occupies a very noticeable time, much longer than is required for transmission along the nerve fibres.[3] From this length of time

[1] Philippeau and Vulpian (*Comptes Rendus*, VI.) and Rosenthal (*Ce alblatt*, No. 29, 1864). [2] Bert. [3] Rose .

the inference is made that resisting forces in the nerve cell are at work influencing the current. In addition, normally, we find nerve cells always present where reflex transfer takes place.

§ 3. The efferent impulses in reflex action are determined both by the nature of the afferent impulses and by the changes taking place at the centre. The nerve-centre remaining constant, the stronger or more numerous efferent impulses will give rise to the stronger or more complex and comprehensive efferent movements. On the other hand, the afferent impulse remaining constant, the efferent effect is greatly enhanced by augmentations from the centre. An afferent impulse passing along a single sensory fibre may give rise to efferent impulses passing along many motor nerves. The contact of a hair with the glottis will induce a violent fit of coughing. A slight contact with the mucous membrane like that instanced would of itself give rise to only a few and those weak impulses; but the result is the discharge of so many efferent impulses as to excite the action of the respiratory muscles and many others throughout the body. Besides the afferent action and the nerve-central action, the efferent effects are controlled also by the interactions of centres and nervous currents, these interferences being sometimes augmentative and sometimes inhibitory. Hence the movements resulting from reflex action are usually very complex.

§ 4. The following are Pfluger's laws of the reflex movements: [1]

1. *The law of simultaneous conduction for one-sided reflex movements.* When a reflex movement takes place on one side of the body only, in answer to a stimulus, it is always on that side of the body on which the irritation of the afferent nerve operates; the reason being probably that the motor nerves proceed from ganglionic cells which are in direct connection with the stimulated afferent nerves.

2. *The law of symmetry of reflex action.* When a stimulus has produced reflex movements on one side and its continuance or its further extension in the spinal cord produces movements of the opposite side, then the corresponding muscles only of this side are affected. This is owing, no doubt, to the commissural system, which connects together the corresponding ganglionic cells of the two halves of the cord.

3. *The unequally intense reflex action of the two sides* in the event of both being affected. When the reflex action is stronger

[1] Maudsley's *Physiology of Mind*, Chap. III.

on one side than on the other, the stronger movements take place upon the side of the irritation.

4. *The law of irradiation of reflex action*, by which an extension of reflex action takes place from the nerves in which it first appears to neighbouring ones, owing to the communications between the different systems or groups of ganglionic cells. When the excitation of an afferent cerebral nerve is transferred to motor nerves, it is observed that the roots of both sorts of nerves are placed nearly upon the same level in the central organ, or that the motor nerve lies a little behind or below, never in front of or above the afferent nerve. If the reflex action spreads further, the way of irradiation is downward to the medulla oblongata; stimulation of the optic nerve, for instance, produces contraction of the iris. In the spinal cord the primarily affected motor nerve lies nearly on the level with the stimulated afferent nerve. But if the reflex action spreads, then it passes upwards toward the medulla. When the irritation has arrived at the medulla, then it may pass downwards again.

5. The reflex action produced by the irritation of an afferent nerve can only appear in three places, whether one-sided or occurring on both sides of the body: (*a*) It appears in the motor nerves which lie nearly on the same level with the excited afferent nerve; (*b*) If reflex action implicates the motor nerves on a different level, these motor nerves are constantly such as spring from the medulla oblongata; tetanus and hysterical convulsions in consequence of local irritations furnish examples; (*c*) The reflex action affects the muscles of the body generally; the principal focus of irradiation thereof being the medulla oblongata.

§ 5. The essence of reflex action then is the production of action through efferent nervous movements which have been transformed into such from afferent impulses through the action of a nerve-cell. For reflex action is required (*a*) a surface external or internal which contains peripheral termini of nerves and which is connected by (*b*) an afferent nerve with (*c*) a central nerve-cell or group of connected nerve-cells which is in communication by means of (*d*) an efferent or motor nerve, or nerves, with a muscle (*e*) or muscles, or some other irritable tissue elements capable of being stimulated by the efferent impulse.

§ 6. Reflex actions may be divided, according to the sphere of their physiological effects, into epi-peripheral and ento-peripheral.

The former include those actions which are manifested at the outer periphery and bear relation chiefly to the functional departments of introsusception and repulsion. The latter include the organic reflexes which operate within the body and occasion functional movements, chiefly of the assimilative and excretory systems. Of the ento-peripheral reflexes, the stimulation of the peristaltic motion of the intestines by the presence of the aliment may be cited. Of the epi-peripheral, the sudden withdrawal of a limb when tickled or irritated may be instanced.

§ 7. Reflex actions may be innate or acquired. The constitution of the organism is such as to create at birth an aptitude for particular reflex actions. Sucking is a reflex action or rather involves it; the closing of the lips around the nipple is a purely reflex act stimulated by the simple contact of parts; and sucking is developed immediately upon birth. Of this order also are the ento-peripheral reflexes, which pursue their course without voluntary interference. On the other hand, the recurrence of a particular stimulation tends to secure the recurrence of the particular reflex effect which followed the original stimulation and thus to educate nervous action into special channels. A vast variety of combined movements accordingly are acquired, varying according to their respective stimulations, but responding regularly and unerringly to those stimulations. They are comprised under and form a portion of what we call habitual actions. Innate aptitudes do much to facilitate and hasten acquisitions of this character.

§ 8. Reflex actions exhibit sometimes a regular co-ordination and sometimes occur in the shape of general convulsions. The former class arise when the peripheral termini of nerves are stimulated alone and in a manner not too violent. When, however, an intense or prolonged stimulus (or both) is applied a general convulsion will often follow. This occurs also when an afferent nerve-trunk is excited, or in disease, or under the influence of certain kinds of poison, particularly that of strychnia.

§ 9. Reflexes are subject to inhibition and augmentation in the same manner as all other nervous actions and themselves contribute to effect or wholly accomplish various acts of augmentation and inhibition upon other actions. When the brain of a frog is removed reflex actions are increased, showing that there must be an inhibitory action of some sort exercised by that organ. The respiratory and vaso-motor centres may be either inhibited or augmented by reflex influences. Goltz observed that in the case

of a dog excited to micturition as a reflex act by pressure on the abdomen the animal was at once stopped by sharply pinching the skin of the leg. In the experiment of the removal of the frog's brain, it is found that after this event, if the animal's toe be dipped into very dilute sulphuric acid, it will be removed after a few seconds; but if the sciatic nerve of the other leg be stimulated while the toe is in the acid, there is a longer interval before the toe is removed or perhaps this last reflex action will altogether fail to appear.

§ 10. We are chiefly concerned with the circumstances and extent of reflex action, without consciousness. With respect to the presence or absence of consciousness, we may note seven classes of reflex actions:—

1. Reflex actions of which we are distinctly conscious.
2. Reflex actions which take place during suspended or interrupted consciousness.
3. Reflex actions which occur prior to the genesis of an individual's consciousness.
4. Reflex actions which take place together with consciousness but either outside the sphere of consciousness or when the whole attention is elsewhere concentrated.
5. Reflex actions which take place in organisms which have been conscious, but whose consciousness has been destroyed by disease or injury.
6. Reflex actions which take place normally in organisms, the existence or nature of whose consciousness is indeterminate.
7. Reflex actions which take place in organisms that cannot be supposed ever to have any conscious experience.

I shall not attempt here to define these classes or to give in detail the various reflex actions comprised under them. A few examples will be sufficient.

§ 11. The last two classes embrace the greater part of the animal kingdom below man. Without assuming to fix the points at which consciousness may fairly be said to begin, we are able to say that reflex action manifests itself at the very beginning of self-mobility and before anything like consciousness can be reasonably supposed to be existent. In the amœba the contact of an impinging body causes movements. Contractility or at least irritability is the prime differentiating characteristic of animal matter; and where anatomical examination discloses a nervous apparatus, as it does very low down in the animal scale, it is evidence that

the response to external stimulus, which we see, is substantially secured through a reflex nervous action. As we ascend in the scale we observe everywhere reflex movements but are unable to say from their presence alone that they are not affected or produced through conscious nervous action because the indications and manifestations of the latter are present also.

§ 12. This difficulty has been overcome by a series of remarkable experiments performed upon living animals by removing or disabling certain portions of the nervous apparatus. Frogs, dogs, and pigeons have been the animals chiefly operated upon. A frog whose cerebral lobes have been removed seems to possess no volitional powers nor any automatic nervous action; but by the application of the proper stimuli, the animal can be made to perform all the movements which the entire frog is capable of performing. 'It can be made to swim, to leap, and to crawl. When placed on its back it immediately recovers its natural position. When placed on a board it does not fall from the board when the latter is tilted up so as to displace the animal's centre of gravity: it crawls up the board until it gains a new position in which its centre of gravity is restored to its proper place. Its movements are exactly like those of an entire frog except that they need an external stimulus to call them forth. They inevitably follow when the stimulus is applied; they come to an end when the stimulus ceases to act. By continually varying the inclination of a board on which it is placed, the frog may be made to continue crawling almost indefinitely; but directly the board is made to assume such a position that the body of the frog is in equilibrium, the crawling ceases; and if the position be not disturbed the animal will remain impassive and quiet for an almost indefinite time. When thrown into water, the creature begins at once to swim about in the most regular manner and will continue to swim till it is exhausted, if there be nothing present on which it can come to rest. If a small piece of wood be placed on the water the frog will when it comes in contact with the wood crawl upon it and so come to rest. Such a frog, if its flanks be gently stroked, will croak; and the croaks follow so regularly and surely upon the strokes that the animal may almost be played upon like a musical instrument. Moreover, the movements of the animal are influenced by light; if it be urged to move in any particular direction it will avoid in its progress objects casting a strong shadow. In fact even to a careful observer the differences

between such a frog and an entire frog which was simply very stupid or very obstinate would appear slight and unimportant except in one point, viz. that the animal without its cerebral hemispheres was obedient to every stimulus and that each stimulus evoked an appropriate movement, whereas with the entire animal it would be impossible to predict whether any result at all, and if so what result, would follow the application of this or that stimulus.'[1]

§ 13. When in addition to the loss of the cerebral hemispheres the animal is deprived of the other parts of the brain, leaving intact the spinal cord only, of the central nervous apparatus, the frog if placed on its back makes no attempt to regain its normal position; when thrown into the water it sinks; if pinched it does not move or crawl away, but simply throws out its limbs irregularly; it does not croak when stroked and appears to have lost all power of co-ordinating movements. In the case of the pigeon whose cerebral hemispheres were removed, 'It ceased at once to evince intelligence and power of spontaneous action and remained in a state of torpor, as if it were asleep. But if thrown into the air, it would fly; if laid on its back, it struggled on to its legs; the pupil of the eye contracted to light, and if the light was very bright, the eyelids were closed. It dressed its feathers when they were ruffled and sometimes followed with a movement of its head the movements of a candle before its eyes; and when a pistol was fired off, it opened its eyes, stretched its neck, raised its head, and then fell back into its former torpid attitude until another stimulus was applied. To each . stimulus it answered by making the proper movements in a mechanical way; the impressions . . reached and affected the . centres[2] which in turn instigated the proper reflex or automatic acts. There was neither intellectual perception nor volitional action, and it would have died of hunger with a plateful of food before it, though it would swallow food when this was pushed far enough into its mouth to come within the range of the reflex movements of deglutition.'[3] 'Similar experiments have been made on other animals with similar results. Vulpian made a complete transverse section of the nerve centres of the rat immediately above the medulla oblongata and then pinched its foot severely; it uttered a short, sharp cry of pain,

[1] Foster's *Text-book of Physiology*, Bk. III. Chap. VI.

[2] I object to the terms *sensory* and *sense* in this connection and have eliminated them from the passage quoted.

[3] Maudsley's *Physiology of Mind*, Chap. IV.

which presumably was reflex.— . . . He then destroyed the medulla oblongata and again pinched the foot; there were reflex movements but there was no cry. In another experiment he removed the cerebral hemispheres, the corpora striata and the optic thalami of a rat, when it remained perfectly quiet; but immediately a sound of spitting was made in imitation of that which a cat makes sometimes, it made a bound away and repeated the jump each time that the noise was made. . . . . Longet having removed the cerebral hemispheres of young cats and dogs, introduced into their mouths a concentrated bitter decoction; he observed that they performed active movements of mastication and made grimaces with their lips as if they sought to get rid of a disagreeable taste.' [1]

§ 14. When the spinal cord of a frog is cut across, so as to separate a portion of it from the brain, the legs are utterly paralysed, so far as voluntary movement is concerned; but they are rigorously drawn up toward the body when an irritant is applied to the foot. 'Touch the skin of the side of the body with a little acetic acid, which gives rise to all the signs of great pain in an uninjured frog. In this case there can be no pain, because the application is made to a part of the skin supplied with nerves which come off from the cord below the point of section; nevertheless the frog lifts up the limb of the same side and applies the foot to rub off the acetic acid; and what is still more remarkable if the limb be held so that the frog cannot use it, it will by-and-by move the limb of the other side, turn it across the body and use it for the same rubbing process. It is impossible that the frog, if it were in its entirety and could reason, should perform actions more purposive than these: and yet we have most complete assurance that, in this case, the frog is not acting from purpose, has no consciousness, and is a mere insensible machine.' [2] Similarly in man, if the spinal cord is divided the limbs are paralysed so far as his volition is concerned, below the point of section. If the cord is separated in the middle of the back, for example, the skin of the feet may be cut, or pinched, or burned, or wetted with vitriol without any sensation of touch, or of pain arising in consciousness; but if a stimulus is applied in the way of tickling the soles of the feet the muscles contract and the limbs are drawn up.[3]

[1] Maudsley's *Physiology of Mind*, Chap. IV.

[2] Huxley's *Animal Automatism*. Cf. Pfluger's *Die sensorische Function des Ruckenmarks*.

[3] Huxley's *Animal Automatism*.

§ 15. We cannot be absolutely certain that there is no consciousness after the mutilations above described; but the strong probabilities are that way.—'It is a highly probable conclusion that consciousness in man depends upon the integrity of the anterior division of the brain, while the middle and hinder divisions of the brain and the rest of the nervous centres have nothing to do with it. And it is further highly probable that what is true for man is true for other vertebrated animals.'[1] 'Our own experience rightly interpreted is adverse then to the opinion that the movements of the decapitated frog evince that its spinal cord is endowed with consciousness. It is hardly conceivable, if it were so endowed, that the creature should never make a single spontaneous movement; that it should remain perfectly quiet until a new stimulus is applied; that its activity should be proportionate to the stimulus; and that it should not profit by its experience of previous excitations, notwithstanding that it is supposed to have as nice a consciousness of the place of the irritation and of the exact movements proper to relieve its sufferings.'[2] If this view be the correct one, then certainly it is demonstrated that a very great complexity of movements and a very high degree of perfection in their co-ordination may take place through reflex action without consciousness.

§ 16. Further and very remarkable examples of reflex nervous action without consciousness may be cited, as under classes 2, 3, and 4 of those mentioned above in § 10; but as we shall afterward have occasion to notice most of them in other connections, their citation now is unnecessary.

CHAPTER XXIV.

AUTOMATIC AND MIXED ACTION WITHOUT CONSCIOUSNESS.

§ 1. IN a preceding chapter (Chap. XXII. § 22) it was remarked that central nervous action is either Reflex or Self-active. Having considered reflex action as existing outside of consciousness, it will next be desirable to take note of self-activity, or, to use a more commonly-employed term, automatic action. And in some combinations of action the reflex and the automatic are so inter-

[1] Huxley's *Animal Automatism*.
[2] Maudsley's *Physiology of Mind*, Chap. III.

mingled that the resultant cannot be regarded as predominantly either one or the other; in which cases it is proper to regard the action or group of actions as Mixed, the mixture being one of reflexion and automatism.

§ 2. Automatic action, like reflex, has its beginning with the beginning of animal life. The two distinguish animal life, broadly speaking (we must not forget that plants also have automatism sometimes quite clearly marked); even though we may not be able to discover a nervous structure, still the phenomena of response to stimulus and spontaneous movement appear. The following remarks upon the amœba are pertinent in this connection. 'When any disturbance, such as contact with a foreign body, is brought to bear on the amœba at rest, movements result. These are not passive movements, the effects of the push or pull of the disturbing body, proportionate to the force employed to cause them, but active manifestations of the contractility of the protoplasm; that is to say, the disturbing cause or "stimulus" sets free a certain amount of energy previously latent in the protoplasm and the energy set free takes on the form of movement. Any living matter which when acted on by a stimulus thus suffers an explosion of energy is said to be "irritable." The irritability may, as in the amœba, lead to movement; but in some cases no movement follows the application of the stimulus to irritable matter, the energy set free by the explosion taking on some other form than movement, *ex. gr.* heat. Thus a substance may be irritable and yet not contractile, though contractility is a very common manifestation of irritability. The amœba (except in its prolonged quiescent stage) is rarely at rest. It is almost continually in motion. The movements cannot always be referred to changes in surrounding circumstances acting as stimuli; in many cases the energy is set free in consequence of internal changes, and the movements which result are called spontaneous or automatic movements. We may therefore speak of the protoplasm of the amœba as being irritable and automatic.'[1]

§ 3. Automatic actions may be divided, according to the sphere of the efferent activity, into Central, Ento-peripheral and Epi-peripheral. In central automatic action the effects are manifested and accomplished predominantly in the centres and intra-central nerves; in ento-peripheral action the effects are developed chiefly

[1] Foster's *Text-book of Physiology*, Introduction.

in the assimilative system,—in digestion, secretion, and circulation; in epi-peripheral action the pervading effects are upon the intro-susceptive and repulsive system.

§ 4. Automatic actions, like reflex, are both innate and acquired, obeying the law that whatever nervous action once occurs has a tendency to recur along the same lines. They are also augmentative or inhibitory in their relations to other nervous movements.

§ 5. Like reflex actions also, automatic actions may be roughly grouped in classes differing according to their respective relations to consciousness. This will give us divisions similar to those of § 10 of the preceding chapter, namely:

1. Automatic actions of which we are distinctly conscious.
2. Automatic actions which take place during suspended or interrupted consciousness.
3. Automatic actions which occur prior to the genesis of an individual's consciousness.
4. Automatic actions which occur together with consciousness, but either outside the sphere of consciousness or when the whole attention is elsewhere concentrated.
5. Automatic actions which take place in organisms which have been conscious, but whose consciousness has been destroyed by disease or injury.
6. Automatic actions which occur normally in organisms, the existence or nature of whose consciousness is indeterminate.
7. Automatic actions which occur in organisms that cannot be supposed ever to have any conscious experience.

§ 6. It is not my object now to delineate or even enumerate all automatic actions without consciousness, nor yet to draw the line between the unconscious and the conscious nervous self-activity. My purpose is simply to call attention to the fact and impress it upon the reader's thought, that as there are reflex actions below consciousness and independent of consciousness though consciousness be coexistent; so in like manner and in parallel degrees are there automatic actions. We have already observed how the latter occur as low down as the amœba; and in a former chapter we found self-mobility to be on the whole the chief distinguishing characteristic of animal from vegetable life. In the lowest forms of animal life we cannot reasonably suppose consciousness is present, but we do know that automatism is present. Proceeding upward in the scale as we run through the

different grades of the animal kingdom, we are at least sure of self-mobility. If no consciousness be present this is at any rate automatic; and if consciousness be present we have evidences by comparison with our own conscious life, aiding our observation materially by introspective examination, and also by various experiments performed upon both living and dead organisms, that very many nervous actions take place automatically in a conscious being without the control of volition, without the presence of feeling as to those actions and without cognition of them.

§ 7. Although the movements of animals whose nervous system has been mutilated are chiefly and prominently reflex; yet there are not wanting evidences of automatic action. Bouillards, repeating the experiments of Flourens, removed the whole of the cerebrum from the brain of a fowl. He records a great number of spontaneous movements. The animal went to sleep apparently and then awaked. She turned her head and buried it under her wing; she shook herself and flapped her wings; when awake she turned her head, changed her place and walked spontaneously; she would cackle and cluck occasionally, and without any external irritation; when put in a cage she would try to escape; she would be very stupid, knowing neither persons, places, nor objects, yet would of her own spontaneity perform many instinctive actions.[1] This record of automatic movement is confirmed by Flourens, whose birds with the cerebrum removed walked about spontaneously. Leyden removed the cerebral hemispheres and the ganglia at their base from a hen; yet the hen moved about and clucked. Meissner observed that a pigeon with the hemispheres removed always would coo and appeared restless at the usual feeding time. Voit noticed that after the cerebrum of some pigeons had been removed for a few weeks, they threw off their stupor, opened their eyes, walked and began to fly about spontaneously; they also manifested signs of sexual feeling with lively cooings.[2]

Moreover, children born without brain have exhibited signs of automatic action. These children breathed, swallowed, sucked, and squalled. A newly-born infant whose brain during the birth had been completely excised to save the mother's life, cried, struggled

[1] *Recherches Expérimentales sur les Fonctions du Cerveau en Général.* See also Lewes's *Physical Basis of Mind*, last chapter but one.

[2] Leyden's *Berliner Klinische Wochenschrift*, 1867, No. 7; Meissner's *Jahresbericht über Physiol.* 1867, p. 410; Voit's *Sitzungsberichte der Münchener Academie*, 1868, p. 105. See also Lewes as above.

with rapid movement of arms and legs and gave other signs of sensibility for some minutes.[1]

§ 8. In the case of ento-peripheral nervous movements, there is usually an intermixture of reflex and automatic action, constituting them *Mixed*. The beat of the heart seems to be the nearest approach to a purely automatic action. 'In the spinal cord separated from the brain by section of the medulla oblongata it becomes difficult to draw a line between purely automatic and reflex actions. Thus . with respiration . while there can be no doubt that the muscular respiratory apparatus is kept at work by impulses proceeding in a rhythmic manner from a group of nerve-cells or respiratory nervous centre in the medulla oblongata, it is an open question whether those impulses, whose generation is certainly modified by centripetal impulses passing to the centre along various nerves, are absolutely automatic: *i.e.* whether they can continue to make their appearance when no influences from without are brought to bear upon the centre. Similar doubts hover around other automatic functions of the spinal cord. We . see . reasons for speaking of the existence in the medulla oblongata of a vaso-motor centre, that is of a group of nerve-cells whence impulses habitually proceed along the so-called vaso-motor nerves to the muscular coats of the small arteries and keep these vessels in a state of semi-contraction or tone. Here, too, it is doubtful whether these motor or efferent impulses can be generated in the absence of all sensory or afferent impulses. The posterior lymphatic hearts of the frog are connected by the small tenth pair of spinal nerves with the grey matter of the termination of the spinal cord in such a manner that destruction of that part of the spinal cord or section of the tenth nerves apparently puts an end to the rhythmic pulsations of the lymphatic hearts. Here it would seem as if rhythmic impulses were automatically generated in the lower end of the cord and proceeded along the efferent nerves to the hearts, thus determining their rhythmic pulsations. But if it be true, as asserted, that the rhythmic pulsations, though arrested for a time by severance of the nerves, or destruction of the lower end of the cord, are after a while resumed, then these too can be no longer counted among the automatic phenomena of the cord. . . . The existence of automatism then even of this comparatively simple character is at least doubtful. That all higher automatism

[1] Panissa; Lallemand; Longet; Berger. See Lewes *op. cit.*

comparable at least to that of the cerebral hemispheres is absent, may be regarded as certain. In the sporadic ganglia the evidence of automatic action seems more clear and yet is by no means absolutely decisive. The beat of the heart is a typical automatic action; and since the heart will continue to beat for some time when isolated from the rest of the body (that of a cold-blooded animal continuing to beat for hours, or even days) its automatism must lie in its own structures. When, however, we come to discuss the beat of the heart in detail we find that it is still an open question whether the automatism is confined to the ganglia (either of the sinus venosus, auricles, or auriculo-ventricular boundary) or shared in by the muscular tissue; whether in fact the automatism is a muscular automatism like that of a ciliated cell, or the automatism of a differentiated nerve-cell. And yet the heart is the case where the automatism of the ganglia seems clearest.

'The peristaltic movements of the alimentary canal are automatic movements; we cannot speak of them as being simply excited by the presence of food in the canal, any more than we can say that the beat of the heart is caused by the presence of blood in its cavities. When absent they may be set agoing and when present may be stopped without any change in the contents of the canal. They may of course be influenced by the contents, just as the beat of the heart is influenced by the quantity of blood in its cavities. Throughout the intestines are found the nerve plexus of Auerbach and that of Meissner; to each or both of these, the automatism of the peristaltic movements has been referred. Yet in the ureter, whose peristaltic waves of contraction closely resemble that of the intestines, automatism is evident in the middle third of its length, even when completely isolated; in which region (in the rabbit at least), according to Engelmann, ganglia and indeed nerve-cells are entirely absent. Thus, while in the spinal cord there is doubt whether purely automatic as stringently distinguished from reflex actions take place, in the case of the sporadic ganglia the uncertainty is whether the clearly automatic movements of the organs with which the ganglia are associated are due to the nerve-cells of the ganglia, or to the muscular tissue itself.' [1]

§ 9. Movements of the fœtus in the uterus may fairly be supposed to be unconscious. Some of these may be reflex, but the extraordinary degree of spontaneous activity manifested in early

[1] Foster's *Text-book of Physiology*, Bk. I Chap. III.

infancy would lead us to suppose that in the pre-natal stage this same spontaneity causes the animal movements of which we have knowledge. Especially is this confirmed by the occurrence of such movements in the supposable absence of external stimulating causes. In waking to consciousness from sleep spontaneous movement precedes sensation. There is a general outpouring of central nervous activity in all directions, occasioning a general commotion of the organism, opening of the eyes, stretching of the limbs, expansion of the features—which are followed by sensational experience.[1] Movements made unconsciously during sleep fall within the category of action during suspended consciousness; so also automatic movements made when under the influence of anæsthetics. But these last, together with all other forms of automatism more directly related to consciousness, will receive consideration in connection with the study of states of consciousness themselves in their various phases of development.

CHAPTER XXV.

THE BEGINNINGS OF CONSCIOUSNESS.

IN THE INDIVIDUAL.

§ 1. INTROSPECTION does not tell me when my conscious experience began. It is beyond the capacity of the individual mind to remember the earliest manifestations of consciousness, which another has observed, recorded, and relates to that individual. So we are compelled to infer from extrinsic evidences when our conscious existence commenced. From those evidences we may broadly state that consciousness in the human individual begins with his birth. This may not be exactly true. The earliest exhibitions of life on the part of the infant are chiefly if not wholly reflex and automatic simply, and he does not at once show volition as manifested by selection: yet he seems to have a sensibility to painful impressions and also to pleasurable ones, as evinced by the quieting effect following the removal of a cause of supposable pain. Bichat and Cabanis hold[2] that though the

[1] Cf. Bain's *Senses and Intellect*, Chap. I. Note also his reference to Aristotle (*Physica*, VIII. 2).

[2] And with them Th. Ribot, *Heredity*, Part III. Chap. I.

external senses are in the fœtus in a state of torpor, and though in the constant temperature of the amniotic fluid the general sensibility of the fœtus is almost null, still its brain has already exercised perception and will, as is evidenced by fœtal movements during the last months of pregnancy. These movements, however, as we have seen, may be accounted for as reflex and automatic, and it does not seem likely that an intra-uterine consciousness can be made out. But we know that the child is born with a nervous system ready formed for receiving sensible impressions and for originating mental action; that this structure begins its functional work at once and speedily develops conscious mental life is the reasonable conclusion. Thus, on the whole we are justified in saying that an individual's consciousness begins with his birth.

§ 2. By inference we believe in the existence of other individuals like ourselves and having minds like our own. The science of states of consciousness is not a science merely of *any* states but of states of consciousness as they exist generally. Since, then, introspection gives us no knowledge of the earliest period of the individual's consciousness and gives no information at all respecting its beginning, and since this process is not sufficient of itself to give a science of the conscious states of others, it is obvious that when we have studied the individual consciousness through introspection we have done very little toward completing a science. Outward not inward observation is the chief method of gathering the facts calculated to throw light upon the genesis of states of consciousness. We believe from our acquaintance with the laws of nature, supported by testimony as to the particular fact that our bodies grew from germs which were once contained in the bodies of other conscious beings; that these beings had their contemporaries and their ancestors; that the remote ancestors developed from other and lower forms of animal life. In order to ascertain how and where consciousness began we must look for evidences of its existence as they appear following down the scale of organic existence and note where such evidences disappear. Or, beginning with the simplest organisms, assuming that with these there is no consciousness, we must follow up the scale till we find some evidence of the existence of conscious life. Introspection must be appealed to for the knowledge of what consciousness is; but outward observation must be relied upon to tell us of the existence of other consciousness than that of the Ego, under

what circumstances other minds or consciousness of other kind or variety can exist, and how, when, and where they all began. If such queries are in any wise susceptible of answer we attain unto a complete science; and if it be ascertained that they cannot be answered, this fact too, with whatever approximation to knowledge there may be, is a matter of science.

CONSCIOUSNESS IN GENERAL.

§ 3. The difficulties in the way of ascertaining when and where consciousness took its rise in organic life are exceedingly great indeed—so formidable as to prevent satisfactory results. There are no preserved records of human existence which date back more than a few thousand years at farthest; and with the existent animal creation below man we have but the most imperfect means of mental communication, while of their past history we have no record save the testimony as to structures which is afforded by fossilised remains. There are two lines of observation which can be followed; the one to observe the various actions of inferior animals now living and determine whether they exhibit signs of consciousness like those we accept as indicating consciousness in man; the other to study anatomically the nervous structures of these animals together with the nervous system of the human organism, and on the principle that like structures imply like functions infer whether a given nervous system can or cannot carry with it consciousness. In pursuing the first of these courses we are embarrassed by the fact that so many and such complicated actions can be performed by simple reflexion and automatism. We know that a large proportion of our bodily movements are accomplished unconsciously, and we have just seen in the two preceding chapters what may occur where no consciousness at all is present. In following the second line, we are at a loss because it has not been ascertained what the nervous changes are which accompany consciousness and how they differ from the movements which take place in reflex and automatic action without consciousness. Imperfect, therefore, at best, is our knowledge of the genesis of states of consciousness; nevertheless we have some data for conclusions which may perhaps furnish a nucleus for future and more important accumulations of facts.

§ 4. It may be well to recall what we mean by consciousness. Turning back to Chapter VIII. and the following chapters we shall

bring freshly to our thought what is expressed and implied by the term. States of consciousness are experiences of the Ego, which cannot be defined, but are ultimate and *sui generis*. They are marked by three inseparable aspects, which may be considered separately, but in fact are never found separately. These aspects are feeling, volition, and cognition and they mutually postulate each other. A feeling postulates a knowledge of that feeling; a cognition something either presented or represented in feeling; a volition an opposition of feelings; feeling and cognition postulate a power to suffer and to act, which must become selective when there is an opposition of feelings. Wherever, then, we find any evidence of feeling, or of cognition, or of selective volition; there we have evidence of consciousness, the presence of either one implying all the others. That there are different qualities and quantities of intelligence, feeling, and volition, goes without saying; but where anything exists which by reasonable analogy to our own states may be called either feeling, selective volition, or cognition, then and there is consciousness.

§ 5. Herbert Spencer has given in some detail the probable genesis of the phenomena of consciousness in connection with the development of nervous action. The line of his argument is that reflex and automatic actions, as they are more simple and are performed with rapidity and certainty, are unconscious; but that states of consciousness arise in their three aspects of feeling, volition, and cognition simultaneously, as the reflex and automatic actions become complex, infrequent, and hesitating. 'Between the reception of certain impressions and the performance of certain appropriate motions there is some inner connection. If the inner connection is organised, the action is of the reflex order, either simple or compound; and none of the phenomena of consciousness proper exist. If the inner connection is not organised, then the psychical changes which come between the impressions and motions are conscious ones: the entire action must have all the essential elements of a conscious action—must simultaneously exhibit Memory, Reason, Feeling and Will; for there can be no conscious adjustment of an inner to an outer relation without all those being involved.'[1]

§ 6. 'In reflex action of the earliest kind, a single stimulus at the periphery of an afferent nerve sends a wave of molecular change to a nerve-centre, whence, through ready-made channels,

[1] *Psychology*, Special Synthesis, Chap. IX.

the wave instantly escapes in a more or less augmented form along an efferent nerve and excites some organ or organs—contractile organs being those to which we may here confine our attention. And such fully-established reflex action, not delayed a moment in its course, is unconscious.

'A compound reflex action that is fully established, though implying the reception of peripheral stimuli by several afferent nerves, the passage of resulting waves through a ganglionic network and the emission of discharges through motor nerves more or less numerous, is also unconscious—the passage through the central plexus not occupying the time which consciousness implies.

'But compound reflex actions in which the co-operating stimuli produce the combined motor impulses, only after a pause, caused by incompleteness in the permeability of the central plexus, may be presumed to have some accompanying consciousness—some feeling that occupies the interval between the receipt of the impressions and the escape of the discharges.

'Each compound reflex action, accompanied at first by consciousness, but made by perpetual repetition, automatic and unconscious, becomes a step towards reflex actions still more compound. These, during their stage of partial establishment, imply consciousness that is somewhat more complex and varied than the earlier consciousness which has been lost in automatic action.

'Besides the consciousness accompanying those reflex actions which are but partially established, there is implied a much larger body of consciousness. For . . . the sense-organs that occasionally receive the special combinations of stimuli which cause automatically certain adjusted contractions of muscles, are sense-organs that perpetually receive stimuli not specially combined—stimuli which are therefore sending into the central plexuses, waves of disturbance that are not instantly drafted off to particular motor organs. These, dwelling in the nervous centres as long as the stimuli continue to be received, imply, as their psychical correlatives, what we call sensations or something homologous with them.

'The great mass of the sensations thus produced by external objects on a creature that has reached this stage of evolution, constitute an unorganised consciousness—a consciousness of which very few components have any specific order or definite meaning. Impressions received through the eyes of such a creature are

mostly mere patches of colour, associated very feebly, if at all, with the tactual impressions yielded by the same objects. Only in the cases of those environing things to which the compound reflex actions or instincts are either adjusted or in course of adjustment, does this raw material of mind rise into nascent intelligence.

'This nascent intelligence exists, however, not only where new compound reflex actions are being established, but also where an established compound reflex action is incipiently excited. Suppose such an animal as we have been considering sees approaching some small creature of the kind on which it preys. Then, while this small creature is coming nearer, but before it has reached the point at which its visual image arouses the reflex action that effects its seizure, a series of visual images, increasing in size and definiteness, must be yielded by it; and it must yield an accompanying series of stimuli to the eye-muscles. Though the reflex action takes place only when the retinal and muscular impressions become combined in a certain way, yet during approach to the required combination the reflex action is tending to arise—there is a gradually increasing excitement of the nervo-motor apparatus which will presently perform the reflex action. The effect does not stop here. Through the established connections there is propagated a gradually-increasing excitement of the nervo-motor apparatus which catching the prey will bring into play—there are produced faint revivals of the tactual and gustatory states which capture of such prey has on past occasions yielded. Thus, then, results what we call perception; for we have here a cluster of real feelings caused by the presented object joined with a cluster of ideal feelings representing certain other real feelings which the object has before produced and can again produce.

'Perceptions of this order are gradually extended to other surrounding things. The apparatus effecting the perceptions which are followed by reflex actions is capable of effecting perceptions which are not followed by reflex actions. Clustered visual feelings yielded by inanimate bodies are, like those yielded by animate bodies, apt to be joined in experience with clustered feelings yielded by them to the skin and muscles; and the two clusters so excited, though less frequently forming a sequence, eventually become correlated in a similar way. Thus the chaotic impressions received from environing objects are slowly evolved into a slightly-organised consciousness of environing objects.'[1]

[1] Spencer's *Principles of Psychology*, Part V. Chap. VI.

§ 7. We have demonstrated the existence of reflex and automatic actions below consciousness, so to speak, and prior to consciousness. It has also been shown, and it will hereafter appear more fully, that consciousness has a tendency to become organised and to pass into unconscious reflex and automatic action again. It seems then that states of consciousness arise midway between ancestrally organised unconscious nervous movements and experientially organised unconscious nervous movements. Out of unconsciousness springs consciousness and into unconsciousness it lapses. The nervous movements which attend unconscious action at both extremities are the same, and the nervous structure is the same. With consciousness there is the same nervous structure, but the nervous movements appear to be modified, the characteristic being a greater complexity of interferences and resistances. A plexus of fibres and cells is necessary to give birth to consciousness; and a complicated and diffused action and reaction of nervous currents is a necessary concomitant. These are the most exact statements which in the present state of knowledge we are able to put forth respecting the genesis of consciousness; and the general circumstances of its beginning, so far as we are able to make assertion, are expressed in the quotations from Mr. Spencer which I have just given. The difference, then, between unconscious nervous action and conscious nervous action is not one of quality of nervous forces but of quantity and interaction.

§ 8. All vertebrate animals normally have consciousness. With them the brain seems essential to conscious life, except in the lowest group. Experiments like those detailed in the two preceding chapters in the way of extirpating or injuring the cerebral hemispheres prove the truth of this last assertion. In all vertebrated animals, except the amphioxus, there exists a brain with separation into fore-brain, mid-brain, and hind-brain. In the lower vertebrates the anterior hemispheres remain comparatively small, but in the higher mammalia they extend forward and backward so far as to cover the other parts; and in addition are enlarged downwards towards the base of the brain.[1] Generally speaking, the development of mental capacities is proportionate to cerebral development; but even in the lowest vertebrates, there is evidence of some degree of mental life, that is of some degree of consciousness. Fishes exhibit sensibility, cognition, and selective activity. They may be tamed and educated, they know localities

[1] Huxley's *Anatomy of Vertebrated Animals.*

including boundaries, they show suspicion, cunning, and wariness, they combine and act in concert, they adapt means to ends, as in the case of eels driving prey for food by forming a circle around shoals of small fish, forcing them ashore;[1] they express expectation, confidence, courage, timidity, sexual and parental love; they vary their behaviour according as they meet friends, strangers, or foes.[2] Frogs engage in trials of strength; toads examine and test the size of crevices in walls in relation to the dimensions of their own bodies, that is to say make measurements or calculations of size and shape;[3] tortoises show discernment and take precautions to avoid danger;[4] serpents, besides the ordinary actions to seize prey and to avoid or defend against enemies, are sometimes susceptible of being tamed and of recognising individuals. Those described by Buckland were the playfellows of the children of the family; they pined by refusal of food in the absence of the master, kissed and embraced him on his return, enjoyed fun and showed signs of pleasure and joy. The snake-charmers by music will influence serpents. Nichols ascribes to certain Australian snakes the repetition and improvement of experiments or trials, which were at first unsuccessful. The evidences of consciousness in birds and mammalia are so numerous and so obvious that it is hardly worth while to recite them. They may be found set forth with amplitude in Dr. W. Lauder Lindsay's 'Mind in the Lower Animals,' (from which work the foregoing instances also have been culled,[5]) and in the more recent work of G. J. Romanes on 'Animal Intelligence.'

§ 9. We cannot say that where animals are structurally constituted without brain, there is no consciousness. The invertebrates have not a fully-developed brain, but they have cerebral or cerebroidal ganglia, which may be regarded as rudimentary brains (see Chap. XXI). They have also numerous other ganglia which are connected with each other and with the periphery by nerves. The cerebroidal ganglia are usually the most voluminous. Many insects, especially those having large eyes, have large cerebroidal ganglia; those of spinning spiders, ants, and of bees are remarkable for volume and for convoluted conformation. In mollusks the cerebral ganglion is small where there is a head not provided with organs of the special senses; large, however, in the contrary case. In the myriapods and the larvæ of insects the nervous system is abundantly provided with ganglia. In the

[1] Jesse. [2] Houzeau. [3] Wood. [4] White and Jardine.
[5] See also Darwin's *Descent of Man*, Chaps II. and III.

crustaceans (as also in arachnidæ and insects) there is a remarkable concentration of ganglia; in the crustaceans sometimes the cerebroidal ganglion and the central chain merge in a common mass, from which the nervous cords radiate. From these facts it is evident that in the invertebrates there exist those conditions in the way of nervous structure which would render possible that complexity of nervous action which seems necessary to consciousness. We should therefore expect to find in them exhibitions of conscious activity, and such exhibitions we do find. We know that these creatures have sensibility, their special senses being sometimes much more acute than in higher animals. Emotions appear to be existent also. The emotion of fear and the realisation of danger are common in crabs, lobsters, and other crustacea.[1] Sir Wyville Thomson says of the amphibious crabs of St. Paul's Rocks 'They were much more wary than the birds. It was by no means easy to catch them; but they kept close round the luncheon baskets in large parties, raised up on the tips of their toes, with their eyes cocked up in an attitude of the keenest observation. And whenever a morsel came within their reach, there was instantly a struggle for it among the foremost of them.' Bates and Gardner assert that will in the form of voluntary determinate action is displayed by certain crustacea, while Houzeau assigns to them memory.[2] Spiders, bees, and ants probably exhibit the most striking evidences of intelligence of any of the invertebrates. 'Among the arachnida the intelligence, industry, ingenuity, perseverance, cunning, and other mental qualities of spiders are well known. An Australian spider constructs a door with bolts (Baden Powell). There are trap-door spiders that construct and make use of a self-acting hinge to their door, which, as mere machinery, is superior to much of man's (Baird and Moggridge). Our ordinary British and other spiders devise means for overcoming difficulties and make repairs of their webs, temporary or permanent (Watson). They must appreciate losses before making them good; they must estimate weakness before they strengthen weak threads. They have a knowledge of mechanical strain; they vary the structure of their web with its position (Houzeau); they even test the strength or security of their webs (Percy Anecdotes). They are liable to be deceived and commit errors, but they discover and rectify their mistakes.'[2] Let us note how the same authority summarises the psychical character-

[1] Darwin, Buckland, Houzeau, Lindsay. [2] Lindsay.

istics of ants. '1. Co-operation for a given purpose. 2. Division of labour, including the working by turns, and the use of relief parties. 3. Use of and obedience to authority, including the employment of a language of command. 4. Understanding each other's language—a language apparently of touch. 5. Organisation of ranks, including military organisation and discipline. 6. Knowledge of the possession of power and the use of it, including the subjection of the weak by the strong, and the subserviency or servitude of one race or rank to another. 7. Judicial punishment of disobedience or rebellion. 8. Forethought or providence, real or apparent. 9. Practice of agriculture, including harvesting and storage. 10. Respect for, including interment of, the dead. 11. Mourning in bereavement or its semblance. 12. Funeral or other ceremonies, including processions. 13. Use of natural tools, or instruments and weapons. 14. The passion of rage or anger. 15. Imagination and its derangement in delusion—*e.g.* in the results of braidism.'[1]

§ 10. Dr. Lindsay thus sums up the results of his observations upon the invertebrata: 'Now if we review carefully and analyse the various mental qualities that have just been described as characteristics of various subkingdoms, classes and orders—genera and species—of the invertebrata, or lowest half of the animal kingdom, it will be found that we have already before us all the elements or essentials of mind as it occurs in man. Though not developed in equal degree, we have nevertheless the higher, as well as the lower constituents of mind—reason, intelligence, thought, as well as mere sensation, instinct, and reflex action. And moreover it is evident that intelligence begins at the very base of the zoological scale.'[2]

§ 11. I quote these conclusions because I believe them to be substantially true. We must, I think, place the beginnings of consciousness much lower down in the animal series than we have been accustomed. We may never be able to determine the point where consciousness begins, but it is safe to say that proceeding downward its territory contracts in proportion as nervous systems grow more simple. I do not consider we are justified in believing in the existence of consciousness where we cannot make out a nervous system: but when proceeding upward we begin to find plexuses of cells and fibres of nerve matter then and there we are

[1] Lindsay's *Mind in the Lower Animals*, Chap. VI.
[2] *Op. cit.* Chap. VI.

approaching the border land of consciousness. And in their beginnings states of consciousness appear in their greatest degree of simplicity, indefiniteness, and homogeneity.[1]

CHAPTER XXVI.

THE GENESIS OF FEELINGS.

PERIPHERALLY-INITIATED FEELINGS.

§ 1. A sensation is a feeling, not a nervous movement. Nerves are said to be sensitive, sometimes said to be sensible or to have sensibility; which means merely that sensation accompanies or follows their excitement or stimulation, but the sensation itself is a purely mental phenomenon; we can only know it as an experience of our own consciousness, ascertained by introspection. No amount of observation upon nerve-systems can give us a knowledge of what a sensation is; we must experience it in order to know it. In a former chapter (Chap. VIII.) we considered the general characteristics of feelings and noted their chief divisions. Peripherally-initiated feelings comprise what are commonly termed *sensations*, both external and internal. The term *sensation* is more convenient than, though not so scientific as the term *peripherally-initiated feeling*; for purposes of convenience we will freely make use of the former, now that we have noted its meaning and thus guarded against misunderstanding. (See again Chap. VIII.)

§ 2. Under sensation we include those feelings which appear to be directly initiated by the impingement of unassimilated (including disassimilated) forces upon the organism or some part of it and by the removal of such forces; also those initiated by movement of the organism itself outward. Sensations are to be dis-

[1] It is extremely discouraging and humiliating to one who has now devoted over twelve years to the systematic study of psychology to be obliged to confess that he substantially knows nothing about the genesis of consciousness—not even the internal physical circumstances under which a state of consciousness takes its rise, continues, and subsides. But the confession must be made. If this is my misfortune I hope it is not my fault. But certainly because one man cannot explain a thing, we must not conclude that it is therefore inexplicable. Patient, persistent, careful study of nerve-structures and their functions inevitably will lead to a great increase of psychological knowledge. And, at least, if I cannot do more, I can raise my voice in urging the most unremitting effort in this direction upon all who are zealous for the attainment of scientific truth.

tinguished from cognitions and volitions; they are to be distinguished from reproduced feelings and from the centrally-initiated feelings commonly called emotions, though of course the latter are not independent of the former and it is sometimes difficult to draw the line between them.

§ 3. An impinging force implies a resisting force and hence all sensations must arise out of contact of two different things. It follows therefore that all our sensations are modifications of one general sense of contact. This we shall presently see illustrated in detail.

§ 4. We have noted that there is a spontaneous activity, of the animal organism moving outward (see Chap. XX. § 2 ff., Chap. XXII. § 22, etc. etc.). Consequently the organism or some part of it may be the impinging force, while the environment furnishes the resisting. Sensation may arise from centrifugal movement of the organism meeting with a resistance in the environment, from the removal or vacation of some experienced resistance or from the movement of something in the environment upon and against the organism. In either case the essential is present of contact of two different things, creating action and reaction. But in the case of the ento-peripheral sensations it seems that the organism is passive and not active so far as creating sensations is concerned; that is to say, sensations arise from the presence and impact of introduced or disassimilated matter or from the push of attractive force or the pull of rending force; in either case the organism being the resisting body.

§ 5. Historically speaking, since the beginnings of life are manifested by spontaneous outward activity and movements occur prior to consciousness (Chap. XXIV.), it is quite certain that sensations primarily arise, both in the individual and in conscious life as a whole, by the impact of the organism upon a resisting environment, rather than in the contrary manner. However, sensation from external impact follows so closely upon the other as to make only a slight chronological priority in favour of sensation from outward movements.

§ 6. Sensations may be divided, according to our localisation of the points of their initiation, into the following classes: —

1. Unlocated Sensations;
2. Sensations of the Introsusceptive System;

3. Sensations of the Assimilative System;
4. Sensations of the Expulsive System;
5. Sensations of the Reproductive System.[1]

The first of these classes embraces sensations which are chiefly ento-peripheral; the second are comprised of sensations characteristically epi-peripheral; the third are principally ento-peripheral; the fourth and fifth include sensations both epi-peripheral and ento-peripheral, in such equal proportions as to make it impossible to assign predominance to either.

1. UNLOCATED SENSATIONS.[2]

§ 7. There are sensations which are not susceptible of definite location but seem to affect the whole organism. Very many of these run into and seem to blend with centrally-initiated feelings, but still are referable to external influences or to conditions of the

[1] See Chap. XIX. Sec. 17 ff.; also Chap. XXII. Sec. 29.

[2] I now labour under the same embarrassment which I expressed in the note on p. 23, this time, however, with regard to the works of Prof. Alexander Bain. He has given the natural history of feelings, volitions, and cognitions in so complete a manner that one of two courses must be taken by later psychologists when they come to the departments in which he has especially worked; they must either take the facts he states and often his statement of them also, selecting what they need for their purposes and perhaps now and then adding something from their own observation, or they must expend a vast amount of labour and ingenuity in trying to obtain facts which he has not stated, with the certain result of exhibiting a collection of the facts of mind inferior in value to Professor Bain's and of less use to any student of psychology. Any one who deals only with special departments of psychological science may escape this dilemma by avoiding the ground covered by Professor Bain, but a writer who ventures upon a complete treatise must meet the difficulty. I have chosen the first of the two courses, and if any one criticises this part of my work and some of the following chapters, especially in Part VI, on the ground that they are little more than an epitome of Professor Bain, I can only say what I have said above and claim further that I have in no case used his results on authority but only after repeating and verifying his observations. Moreover I must indulge the hope that I have here and there added a little to psychological science over and above what Professor Bain and others of my predecessors in psychological study have given to the world.

If I did exact and complete justice, I should have to make a similar statement several times and with reference to several persons in the course of my treatise. But this it would be tedious to do. I have only been endeavouring to present psychological science as it is with occasionally some contribution of my own in the way of original observation objective or introspective. If my work has any independent or original merit, it probably lies to a great extent in the direction of method and arrangement in dealing with the materials gathered by others.

internal medium. The general sensations of discomfort which arise from the diseased condition of an organ or set of organs is an instance. The diseased organ may have its own proper sensations which are quite discernible; but in addition there is a diffused feeling of debility and morbidity which pervades the whole system. The feeling of inanition is a sensation which we can scarcely locate; so also the sensations of extreme thirst. There seem to be many sensations of approaching dissolution which are the extremes of debility and prostration and which appertain to the whole system. Many of the sensations of fatigue are general. When the effect of a stimulus passes beyond the locality of its first manifestation and exalts or depresses the vitality of the whole organism, then appear sensations which we cannot definitely locate.

§ 8. Among sensations of this class should be ranked the general feelings of atmospheric conditions. Sometimes the effect is tonic, sometimes the reverse. The amount of electricity or of ozone in the air probably has its effect on the general system. So the advent of light after darkness and the coming on of darkness after light affect the vitality. On the eve of an earthquake or volcanic eruption great and marked depression is often felt by large numbers of people. It is stated that just prior to and during a most extraordinary display of aurora borealis at Cleveland, Ohio, in 1882, many people experienced this same depression, sometimes amounting to faintness. The general feeling of pleasure and elation which marks the exuberant vitality of the young, so far as it is sensational, is not susceptible of location. No doubt this experience is largely emotional, but some considerable part must be attributed to sensation. The feelings of health and disease, integrity of the organism and disintegration, although they give rise to and are themselves sometimes emotions of various sorts, yet must be considered to be chiefly and fundamentally ento-peripheral sensations.

§ 9. The feelings of cold and heat in the main are general and unlocated. These feelings are determined and measured by the heat of the blood, which is naturally about 98° Fahrenheit. The contact with the body of anything external whose temperature is above this point, occasions a feeling of heat; below, a feeling of cold. So also heat is felt when the temperature of the blood is raised and cold when it is lowered. The surplus heat generated in the human organism retained and preserved by clothing and

increased by exercise enables us to live comfortably in a temperature of the atmosphere varying from 60° to 70° F. The general effect of cold, when not too severe, is to stimulate and quicken all the functions, while the general effect of heat in corresponding degree is to debilitate and depress. But intense heat and intense cold are alike in their sensations, since their effect is to produce disorganisation, from which ensue the sensations of disintegration —like those of a sharp cut or bruise. Where these extremes do not exist, the feelings of heat and cold are voluminous and massive rather than acute. A great intensity in small quantity can often be borne better than a relatively small intensity and great quantity. The insertion of the tip of the finger or even the whole hand or foot in a very warm bath can be endured better than the sensations arising from plunging the whole body into water several degrees lower in temperature. When the sensations of heat and cold are localised, the skin is usually the place of their manifestation. A burn on the tongue or the sides of the mouth is also a frequent example of local heat sensation.

2. SENSATIONS OF THE INTROSUSCEPTIVE SYSTEM.

§ 10. Sensations of this class are properly susceptible of subdivision as follows:—

a. Sensations of Resistance and Non-Resistance.
b. Sensations of Dermal contact, or Touch.
c. Sensations of Olfactory contact, or Smell.
d. Sensations of Gustatory contact, or Taste.
e. Sensations of Auditory contact, or Hearing.
f. Sensations of Ocular contact, or Sight.

These we will now examine in their order.

a. *Resistance and Non-Resistance.*

§ 11. The broad proposition may be enunciated that all sensation arises from the contact or contiguity of different things. From this fact we have one general and fundamental class of sensations, of which in fact all others are but differentiations. This is the class we have now before us for consideration. For sensation there is required a central nervous organisation, which constitutes the sensorium and its lines of communication; an internal environment or medium which directly sustains the sensorium and completes the organism; finally an external environment which

presses upon the organism and on which the organism reacts. We find sensation, then, arising under the following circumstances: (1) When there is motion of the organism followed by resisting contact with the external environment; (2) When there is motion of the environment upon and contact with the resisting organism; (3) When there is motion of one part of the organism upon another together with corresponding resistance; (4) When there are combinations of the foregoing. Therefore, all sensation is some form of an experience of motion and resistance to motion; and all sensations are sensations of some mode of resistance and extension or non-resistance. We have already seen that when feeling is generated it is invariably in connection with motion and resistance in nerve-matter. In sensation there is contact with afferent nerves, either epi-peripheral or ento-peripheral, and the feeling arises as the transmitted motion along the nerve meets with resistance at the centres. This contact with afferent nerves may be contact of force from without or from within the organism; sensation is found to occur in either case. From considerations like the foregoing, therefore, it appears that in the ultimate analysis sensation is reduced to experiences of different modes of motion and resistance.

§ 12. In former chapters (Chaps. XII., XIII., XVII. and XVIII.) it has been urged that we have no experience of resistance without a correlated non-resistance; that we only know resistance by non-resistance and the converse; that extension and resistance are primitive sensations mutually interdependent. In other words, we cannot have a sensation of resistance except as correlated with a sensation of extension; the one is the sensation of force, the other the sensation of space. When I put forth the arm in movement, I have a sensation of extension or non-resistance in the external environment and of resistance in the muscular and osseous apparatus of my own body; when the arm strikes an external resisting body, there is a further sensation of resistance but only as succeeding a prior sensation of extension. When I move my hand laterally along the wall, there is a sensation of resistance in one direction, and extension or non-resistance in another. Resistance means resistance to moving force; and motion implies non-resistance. Wherever there is motion there is a sensation of extension of a resisting body, a sensation consequently of correlated extension and resistance. All our sensations arise from motion and resistance; and hence the

sensations of extension and resistance are the fundamental sensations, and are equally primordial and basic.

§ 13. The locality of the organism in which sensations of extension and resistance are primarily and predominantly initiated is the introsusceptive system, and therein most especially in the muscles. We will take note of a few prominent groups.

Extensor Movements.—These are the movements which straighten the limbs, and hence comprise movements outward from the centre; they are governed by the extensor muscles. They include the movements of *pushing* outward.

Flexor Movements.—These are effected by the flexor muscles, which bend the limbs inward toward the centre. They accomplish the *pulling* movements.

Compelled Movements.—These occur in such cases as riding in a vehicle or on horseback, rocking in a chair, swinging, and the like. The irregularity of the movement requires a gentle action of the muscles to adapt the position of the body to these irregularities.

Loss of Support.—This gives rise to a peculiar sensation. It is illustrated in the sudden giving way of a support on which one has been leaning or sitting. Where it affects the whole body it induces various ento-peripheral sensations of a painful character, as dizziness and nausea.

Slow Movements.—Extension is the sensation of resistance moving away or vacating. The sensation differs according to the rapidity of the motion. Slow movements include those of the legs, arms, head, facial muscles, and slow speech. They hence appear in lazy or indolent manners, in sauntering, loitering, deliberation of movement, and also careful action, as in feeling one's way. Such movements are allied with muscular repose.

Quick Movements.—These tend to produce excitement and its attendant feelings. Rapid walking, running, dancing, gesticulating, vehement speech all induce sensations very different from those attendant upon slow movements.

§ 14. *Tonicity.*—Occupying a sort of middle ground between sensations of extension and those of resistance are sensations of simple muscular tonicity. The muscles, after apparently ceasing to contract, remain in a state of tension, and have still a tendency to approximate their points of attachment, although this tendency is counterbalanced by antagonistic muscles in the same condition of tension; thus equilibrium is produced and preserved.

Resistance to Extensor Movement.—This sensation is experienced when the limb or member is moved outward and meets an object which abates or quenches the motion.

Resistance to Flexor Movement.—This corresponds to the sensation of extension noted in connection with the flexor muscles in the last section. It occurs when we clutch anything or pull it toward us.

Inhibition of Movement.—The resistance may be strong enough to diminish the motion, but not wholly extinguish it. Sensations of inhibition hence arise.

Resistance to Gravity.—The supporting of a weight on the back, head, chest or arms illustrates the sensation of resistance to impinging pushing force. Pressure against the body is a sensation of the same class. Allied are the sensations of supporting the body's own weight, or that of particular limbs. The sensations of correlative extension arise and increase as resistance diminishes, and contrariwise.

Resistance to Pulling force from without is another variety of muscular sensation.

§ 15. *Combined Extension and Resistance.*—Our sensational experience exhibits a very great variety of sensations of motion and resistance, occurring in alternation and combination. This variety is rendered possible by the separate mobility of a great number of members of the organism. In walking, for instance, there is flexor and extensor motion; the foot is impelled upon the ground, which furnishes resistance; the foot is removed and the resistance disappears, while the other foot is still pressed upon the earth; the breeze at the same time blows upon and is resisted by the face; the hat presses upon the head; the pressure of the clothing is felt; also the weight of the body; the hand clutches and resists the pull of the cane or umbrella. It would be impossible to give an exhaustive catalogue of all the combinations of motion and resistance experienced in sensation by the organism. But the following, by way of summing up what has been cited, will indicate the chief elements which enter into combinations both simultaneous and successive:

1. Unimpeded extensor motion of the organism or part of it.
2. Unimpeded flexor motion.
3. Tonicity of the muscles.

4. Resistance of one part of the organism to another.
5. Resistance in the external environment overcoming outward motion (both flexor and extensor) of the organism.
6. Resistance in the external environment overcome by outward motion of the organism (partially inhibiting the outward motion).
7. Resistance in the organism overcoming impinging force from without.
8. Resistance in the organism overcome by impinging force (partial inhibition).

§ 16. *The Voice.*—The organs of speech, in their exercise, exemplify various sensations of extension and resistance. They are comprised in the opening and closing of the mouth, the movements of the tongue, the forcing of the air through the glottis, and the dilatations and contractions which generate articulate speech or inarticulate sounds.

Respiration.—Although the office of respiration is related primarily to the assimilative system, the introduction of air to the lungs is introsusception. Hence we may note here the sensations of breathing. Aside from the movements felt, there is much organic unlocated sensation, but still the act of introducing and expelling gives a variety of sensations of extension and resistance.

Exercise.—Most of the sensations to which we have adverted above can be included under the general head of exercise, or active use of the different members of the body. All these movements give rise to many organic unlocated sensations—of exhilaration on the one hand, and of depression or fatigue on the other. They also have emotional, intellectual and volitional relations which we will not now consider.

§ 17. A question has arisen as to whether the sensations of movement outward arise in connection with afferent nervous currents or with efferent. On the one hand, it is claimed that feelings of movement are distinct from sensations in that they are characterised by a feeling of effort put forth which is connected with efferent motion only. On the other hand, it is urged that this feeling of effort is only sensation of muscular action and reaction which is communicated by afferent nerves, and that the efferent movements are unattended with feeling. It is probable that the latter is the truth. What the intellectual and

volitional associations are of feelings of energy put forth, will appear in a subsequent place.[1]

b. *Dermal Contact, or Touch.*

§ 18. Important modifications of sensations of resistance and non-resistance arise through a special sensibility of the skin and certain mucous membranes. The special organs of touch are the papillæ (Chap. XXII. § 5), which furnish an immense number of separate points for contact with the environment. These papillæ are of a conical shape, round or blunted at the top, and are received into corresponding pits on the inner surface of the cuticle. They measure on the hand from $\frac{1}{100}$ to $\frac{1}{200}$ of an inch in height. In the ridges the large papillæ are placed sometimes in single but more commonly in double rows, with smaller ones between them, that is, also on the ridges, for there are none in the intervening grooves. These ridges are marked at short and tolerably equal intervals with notches or short transverse furrows. The papillæ are most numerous and larger where the tactile sensibility is the greatest, namely on the palms and fingers, the corresponding portions of the foot, the forehead, temples, and forearm.[2] 'The *tactile corpuscles* lie in the papillæ of the dermis, and are oval and about ·08 mm. ($\frac{1}{300}$ inch) in length. They contain a soft core, enveloped by a connective-tissue capsule and separated into several masses. Two, three, or more nerve-fibres go to each corpuscle, and appear to end in plates lying between each of the segments of the core. Tactile corpuscles are numerous in the skin of the hand and foot, but are rare elsewhere.'[3] 'Simpler bodies, the *touch-cells*, of the same essential structure but receiving

[1] The doctrine of efferent feeling attending muscular movement is maintained by Bain, Hughlings-Jackson, and Wundt. The opposite view has been held by the majority of psychologists, and has been reasserted against criticism by Dr. Bastian, Dr. Ferrier, and Professor Wm. James. In this case I vote with the majority, and refer the reader for a full discussion of the subject to Professor James's paper entitled *The Feeling of Effort*, published Boston, 1880. Professor James says: 'I maintain that the feeling of muscular energy put forth is a complex of afferent sensation coming from the tense muscles, the strained ligaments, squeezed joints, fixed chest, closed glottis, contracted brow, clenched jaws, etc. etc. That there is over and above this another feeling of effort involved I do not deny; but this latter is purely moral, and has nothing to do with the motor discharge. We shall study it at the end of this essay, and shall find it to be essentially identical with the effort to remember, with the effort to make a decision, or to attend to a disagreeable task.'

[2] Quain's *Anatomy*.

[3] Martin's *Anatomy of the Human Body*, Chap. XXIV.

only one nerve-fibre each, are distributed all over the skin; the more complex and probably the more irritable form being found where the epidermis is especially thick.'[1] In addition to these there is another variety of tactile nerve-ending called *end-bulbs*. 'The end-bulbs are spheroidal and about ·04 mm. ($\frac{1}{600}$ inch) in diameter. Each consists of a core, with a connective-tissue capsule, to which two or three nerve-fibres run; the axis cylinders penetrate the core. End-bulbs are found on one or two regions of the skin, as that on the red part of the lips, in the conjunctiva, and the mucous membrane covering the soft palate and the tongue.'[1]

§ 19. By the tactile sensibility we are enabled to discriminate and compare varieties of sensations of extension and resistance to an extent far beyond that allowed by the simple muscular sense. It is also of prime importance in the localisation of those sensations. It has been found[2] by placing two points of a pair of compasses blunted with wax at different distances apart on various portions of the body, that the smallest distance at which contact can be distinguished to be double varies in different parts between the thirty-sixth of an inch and three inches. The finest and most delicate discrimination is made by the tip of the tongue, the fingers, the red surface of the lips, the tip of the nose, palm of the hand, end of the great toe and the cheek. The least sensitive portions in this respect are the middle of the abdomen, thigh, arm and leg, the back of the neck and the back. In regard to this sensibility, it must be remarked that though we are sensible of a plurality of sensations primarily, we are not enabled by simple contact to determine how far apart the points of contact are, nor indeed without experience fix the locality of the sensation. There must be added sensations of movement. With the sensations of movement and resistance in their various forms, made minutely distinguishable by means of the tactile sensibility, we can measure distance, direction, force, motion, size, form and position.

§ 20. The greater degree of pressure measures chiefly the predominance of the muscular sensibility over that of touch proper. When a simple contact occurs, the nerves of touch alone are sensibly stimulated; as pressure increases, however, not merely the skin but the muscles are affected, and though the tactile sensibility is present also it is overmastered by the

[1] Martin. [2] Weber.

muscular feelings. Still in such a case the discriminations just mentioned are materially aided, and sometimes entirely accomplished, by the sense of touch. The definite knowledge of extension and the degrees of resistance of all kinds—together with that of the innumerable combinations of extension and resistance—all are gained only through dermal sensations.

§ 21. The sensations of extension and resistance arising from the compounding of muscular sensations with dermal give, therefore, the sensations of magnitude and similitude in all their variety. In other words, they are sensations of quantity. They are not the only sensations conceived in the intellectual appreciation of quantity, as we shall presently see, but they will of themselves give appreciable distinctions and degrees of intensive, extensive, and protensive quantity.

§ 22. Not dwelling further at this stage upon the intellectual associations and connections of tactile and muscular sensations, we will notice a few groups which have more particular bearing upon the emotional and volitional states.

Acute Contact.—This is a contact at a point or at distinguishable points. The sensation is most marked where the contact amounts to penetration of the surface of the skin. It is the foundation of disintegration sensations.

Massive Contact.—These sensations are of superficial or solid contact, and they are ordinarily characterised as voluminous in contradistinction to intense sensations, which primarily belong to the *acute* class.

Soft Contact.—These are massive, and include a great variety of feelings, the emotional associations being numerous. The contact of the bed-clothing upon the body at night, the stroking of the fur of a cat's back, sitting on soft cushions or lying in feather beds, the joining of hands, the embrace—all furnish illustrations.

Hard Contact.—Of an opposite nature is hard contact, the characteristic differentiating it from the last class being the unyielding nature of one or both of the contiguous bodies.

Friction.—Gentle friction of a soft body is the extension counterpart of the sensation of resistance in soft contact; of a hard body the extension counterpart of hard resistance. Slow friction, of course, belongs to slow movements, rapid friction to quick movements.

Tickling is an acute sensation, associated however with friction.

The beginning of the friction of a brush on the body gives rise to a sensation of the nature of tickling. As the pressure is increased the sensation grows more massive and loses its acute character. The sensations in the nose preceding a sneeze, of a fly walking over the face, of a feather brushed lightly upon a sensitive place on the skin, are good examples of tickling in its simplest forms, uncomplicated with the massive sensations of pressure.

Stinging.—When the skin is penetrated and its normal condition disturbed, the feeling which may have begun in tickling passes into stinging. The latter may occur independently of the former but often succeeds it, as in flagellation. The touch of nettles, the prick of pins, the stings of bees are illustrations. These sensations are acute.

The above are only a few groups of dermal sensations, more or less involved with muscular. The varieties are practically infinite. Two other classes might be instanced which are of some prominence; namely, *Smoothness* and *Roughness*, the first being an extension sensation in its salient aspects and the latter one of resistance. In the former case the extension is continuous along a resisting surface, in the latter it is interrupted by a succession of resistances. The sensations of liquidity and of gases in motion furnish also their peculiarities. To enumerate, analyse and classify all these varieties of sensation, would require a work so large as to leave room for little else, unless indeed a cyclopædia of psychology were attempted.

§ 23. *Thermal Sensations.*—In addition to the organic unlocated sensations which are induced through differences of temperature, there is a dermal sensibility which must not be overlooked. Different degrees of heat and cold are apprehended by sensations at the surface of the body. Also substances are often distinguished tactually by their difference in temperature. The sensitiveness to heat and cold is different in degree in different parts of the body, which sensitiveness does not seem to be determined by the abundance of nerves present in the part affected. It is still an open question whether or not certain nerve-terminations in the skin are sensitive to temperature and others not, and whether the tactile nerves are the same as those which convey thermal sensations. It is quite possible that a special sensibility may be demonstrated; but it seems too soon to say that one actually has been shown.

§ 24. It is observed that when one part of the body touches another, the temperature being the same, the part endowed with the finer tactile power feels the other. If the temperatures are different, the impinging part feels the other tactually, while the latter feels the temperature of the former. The hand is not felt tactually by the brow, nor the coldness of the brow felt by the hand. Of two substances of the same weight the colder seems heavier to the hand.

It is claimed that the feeling of wetness is nothing more than a form of cold; but this may well be doubted.

Sensations of heat and cold are both acute and massive. The extremes of heat and cold give rise to very similar sensations. The sensations of acute heat and acute cold are very like those of a cut or prick of a sharp instrument.

c. *Olfactory Contact, or Smell.*

§ 25. When certain gaseous or volatilised particles of matter enter the nose and reach the afferent nervous apparatus contained in the inner and upper chambers, sensations are produced which we term sensations of smell. The surface sensitive to smell is the interior nasal lining, a membrane covering the whole of the interior cavities, connecting with the external skin, with the mucous membrane of the pharynx, with the conjunctiva of the eye, and with the lining membrane of the hollows which communicate with the nasal chambers. The olfactory membrane is highly vascular and well supplied with nerves, but varying in its different parts in both these respects; the distribution of nerves being more abundant in the interior away from the outer openings. The membrane varies also in thickness. The nerves ultimately concerned are the fifth pair and the olfactory nerve, the latter passing inward to the olfactory ganglion, which is prominent in the brain of all the vertebrates and in the lower orders constitutes a distinct lobe or division of the encephalon.

§ 26. It is supposed that the action by which the sense of smell is stimulated is a chemical one. In general odorous substances are such as can readily be acted on by oxygen. Unless a stream of air containing oxygen passes into the cavities of the nostrils together with the odorous matter, no sensation of smell is produced; and if a current of carbonic acid is introduced the odour ceases. Moreover some combinations of hydrogen have been

actually shown to be decomposed in the act of producing smell. When seleniuretted hydrogen is passed through the nose, the metallic selenium is found deposited upon the lining membrane. The passage is accompanied by a very disagreeable odour.

§ 27. The greater number of gases and vapours are odorous. The elements of the atmosphere are inodorous, except carbonic acid, which in large quantities has a pungent smell; ozone also has odour. Solid mineral substances often emit odours, as arsenic, quartz when broken, phosphorus and sulphur. The odours of the vegetable kingdom are of infinite variety and embrace the most delicate and agreeable of smells. Animal odours are numerous, some being peculiar to the species, as that of the skunk. As a rule, animal odours are not pleasant. With reference to their chemical composition, the pleasant odours emanate from the hydro-carbons chiefly, while the disagreeable often come from substances which contain sulphur and arsenic in some form.

§ 28. The production of odours is favoured both by light and heat. Light aids development, and heat volatilises and decomposes. In sunny climates and in the summer season odours are more abundant. Moisture is also an aid; after a shower we notice more particularly odorous matter. Friction is another source of odours, as may be observed by rubbing and crushing plants. Sweet odours are more persistent than disagreeable ones are. In diffusibility there is a great variation in odours. Sulphuretted hydrogen, for example, diffuses very rapidly; on the other hand, most of the animal effluvia are dense and slowly diffusible. In scenting a pointer keeps his nose close to the ground, showing the tendency of the gases to sink. Very small quantities of odorous matter are often sufficient to excite sensation. It has been caused by $\frac{1}{8,000}$ grain of phosphuretted hydrogen; $\frac{1}{30,000}$ grain of sulphuretted hydrogen; $\frac{1}{1,300,000}$ grain of oil of resin, and by a smaller quantity than the last of musk.[1]

§ 29. Sensations of smell are frequently complicated with those of taste to such a degree as to make it very difficult to separate and distinguish the one class from the other. In drinking water impregnated with sulphur, for example, we are quite at a loss to know whether it is a bad smell or a bad taste that is affecting us. In reality it is both, but we are not able to define the limits of either. In the same confused way we become conscious

[1] Valentin.

of the flavour of food while eating, through mingled and indistinguishable sensations of taste and smell.

§ 30. The closest associations of smell other than those just now stated are with sensations of the respiratory organs and ento-peripheral sensations of the digestive. From sensations of smell there is a frequent and ready passage to sensations of *freshness* arising from pleasurable inhalations, which carry with them organic and to a large extent unlocated sensations of invigoration and vitality. In a contrary direction, feelings of suffocation are often consequent upon and simultaneous with bad smells. Many odours have a nauseating effect upon the digestive system, while others have the effect to stimulate the appetite; the latter are often spoken of as appetising smells.

§ 31. The sense of smell is found developed to a far higher degree of perfection among the lower animals than with man. The greatest degree of acuteness with which we are familiar occurs in the case of the dog. The carnivorous animals and certain insects have the sensibility highly developed. In the human races, savages have a more acute sense of odours. The North American Indians can follow their game or their enemies by the scent, and in the Antilles the maroon negroes distinguish by their scent a white man's trail from a negro's.[1] The whole negro race have an extraordinary development of this sensibility.

§ 32. The classifications of odours with reference to their sensational aspects relate chiefly to their pleasurable or painful qualities. We will notice the following groups:

Fragrances.—These are usually described as *sweet* odours, but the term *sweet* applies to so many other varieties of sensation that its use is not to be recommended. The fragrant odours of flowers and fruits are the most prominent examples. Fragrances are pleasurable in sensation, and are acute.

Stinks.—These are painful odours opposed to fragrances. They give acute, rather than massive sensations. Among the most painful stinks are those of sulphuretted hydrogen, asafœtida and decaying animal matter.

Pungent Odours.—The sensation of pungency is the peculiar sensation caused by ammonia. It is a sensation of smell combined with simple tactile contact, and arises from a disturbance of the nasal tissues. It remains when the organ of smell has ceased to be susceptible to the proper sensation of the objects: snuff-takers

[1] *Dictionnaire des Sciences Médicales.* Art. Odorat.

are sometimes devoid of sensibility to odours, but are susceptible to the pungency of the nicotine in the snuff. Similar sensations to those of pungency in the nose, arise in the tongue or on the skin anywhere: pungency is an irritation of the nerves, not amounting to a very sharp pain. When pungency and odours proper are combined we have what is called an *ethereal* smell, as of alcohol, ozone, and chloroform.

d. *Gustatory Contact, or Taste.*

§ 33. When certain liquefied particles of matter are brought into contact with the mucous membrane on the dorsum of the tongue and with the nerves there found, sensations are produced which we express by the term *taste.* Possibly other parts of the boundary of the mouth cavity are sensitive in the same mode. 'The nerves concerned are the glosso-pharyngeals, distributed over the hind part of the tongue and the lingual branches of the inferior maxillary division of the trigeminals on its anterior two-thirds. On the tongue the nerves run to papillæ, the circumvallate have the richest supply, and on these are certain peculiar end-organs known as *taste-buds*, which are oval and imbedded in the epidermis covering the side of the papilla. Each consists externally of a number of flat, fusiform, nucleated cells, and internally of six or eight so-called taste-cells. The latter are much like the olfactory cells of the nose, and are probably connected with nerve-fibres at their deeper ends. The capsule formed by the enveloping cells has a small opening on the surface; each taste-cell terminates in a very fine thread which protrudes there. Taste-buds are also found on some of the fungiform papillæ, and it is possible that simpler structures not yet recognised, consisting of single taste-cells, are widely spread on the tongue, since the sense of taste exists where no taste-buds can be found. The filiform papillæ are probably tactile.'[1]

§ 34. It is supposed that taste, like smell, is produced by chemical action, inasmuch as the chemical constitution of bodies principally determines varieties of taste. Taste may be produced by galvanism or by a stream of cold air directed upon the tongue. Moisture must always be present to induce taste. If the tongue is dry or parched, there is no taste sensation unless imparted by the impinging substance. Solution is essential to the sapidity of

[1] Martin's *The Human Body.*

bodies. Taste is much influenced also by the extent of surface acted upon; and is also heightened by the motion and moderate pressure of the substance on the membrane.

§ 35. Of mineral bodies, pure water and the elements of atmospheric air have no taste. All acids, all alkalies, and nearly all soluble salts are sapid; in salts the taste being determined more by the base than by the acid. Vegetable and animal bodies give rise to a very great variety of tastes. It is said that of all sapid substances acids and bitters can be the most readily detected; then saline, and lastly saccharine bodies. It has been found that one part of sulphuric acid in 10,000 of water, one of sulphate of quinine in 33,000 of water, can be detected when carefully compared with pure water. Sugar cannot be detected when there is less than one in 80 or 90 of water; and of common salt one part is necessary to 200 of water.[1] Crystalloid bodies are much more sapid than colloid, the latter being generally insipid.[2]

§ 36. The most intimate associations of taste are with the tactile sensibility, with smell, and with the digestive sensations. This last connection has not been remarked. The sensations of taste are closely involved with sensations of *relish*, which are organic and relatively unlocated, and with their opposed sensations of *disgust*. These sensations begin in the contact of substances with the walls of the mouth and throat, but are not sensations merely of taste. To all persons carrots have a sweetish taste, but some people have a relish for them and some a disgust. Saline water has a salt taste, but sometimes it is relished and sometimes disgust is excited. Sensations of simple taste and those of relish bear somewhat the same relation to each other as simple touch and muscular sensibility. Relishes and disgusts relate to the whole digestive system, and depend upon appetite cravings and organic repulsions; yet the mouth, tongue and throat appear to be the seat of the sensation.

§ 37. *Sweet Tastes.*—These are exemplified by the taste of sugar, and they are caused by a great variety of substances. They generally excite a relish, and are pleasurable. The word *sweet* is used in different senses as opposed to *sour*, *bitter*, and *putrid*. The last sense, however, is one derived from associations of sweet with agreeable or pleasant. The great majority of our agreeable tastes are saccharine.

Bitter Tastes.—The proper opposite of sweet taste is bitter, and

[1] Marshall. [2] Graham.

not sour taste. Sweetness is pleasurable; so also is sourness frequently; but bitterness is not unless the tongue is educated to it. The characteristic bitter tastes are those of quinine and quassia. Bitter, like sweet, is an acute sensation.

Saline Tastes.—These are the tastes which are exemplified in that of common salt. As to the acute sensation, it is indifferent so far as pleasure and pain are concerned; the relish involved with salt taste is, however, often very great.

Alkaline Tastes.—These are the tastes of potash and soda. They are also indifferent as to pleasurable and painful quality.

Acid and Sour Tastes.—Vinegar and lemon juice are characteristic examples of this class. Acid tastes are acute, pungent, and penetrating. When the acid is diluted the taste is usually agreeable; when the acid is so strong as to disintegrate the tissues, all taste is speedily lost in other sensations.

Astringent Tastes are tastes like that of alum; *Fiery Tastes* like that of alcohol, mustard and red pepper; *Acrid Tastes* combine the fiery and the bitter. In all these and similar tastes, the peculiar characteristics of the sensation arise from effects upon the tissues of a tactile nature, and the taste proper is not the most important element in the sensation; often the latter is wholly nullified and destroyed.

§ 38. It will be seen that, as in the case of sensations of smell, the chief values of taste sensations are values of pleasure and pain. Taste may be cultivated to very high degrees of discriminative ability, as is seen in the skill of wine tasters in detecting minute differences. Tastes may also be educated so as to become either pleasurable or painful from the opposite or from indifference. In the course of an individual's life tastes are in this respect constantly varying, the needs of the assimilative system appearing to govern relish and disgust, which in their turn control the pleasures and pains of taste proper. Among the lower animals taste is well developed in the vertebrates, but in the invertebrates we do not find taste organs distinctly marked except in insects and some mollusks.

e. *Auditory Contact, or Hearing.*

§ 39. When certain particles of matter in a certain manner of motion impinge upon the termini of certain afferent nerves which are situated within the ear, sensations result which we term sensations of hearing. The ear is the organ of hearing, and the

auditory apparatus is much more complicated than the organs of any sensibility we have heretofore noticed. A somewhat detailed description will, therefore, be given.

§ 40. The following descriptions are taken, by permission, from 'The Human Body.'[1]

The External Ear.—The auditory organ in man consists of three portions, known respectively as the *external ear*, the *middle ear* or *tympanum*, and the *internal ear* or *labyrinth*; of these the latter is the essential one, containing the end organs of the auditory nerve. The external ear consists of the expansion seen on the exterior of the head, called the *concha*, and a passage leading in from it, the *external auditory meatus* (*D* to *c*, fig. 7). This passage is closed at its inner end by the *tympanic* or *drum membrane*. It is lined by a prolongation of the skin,

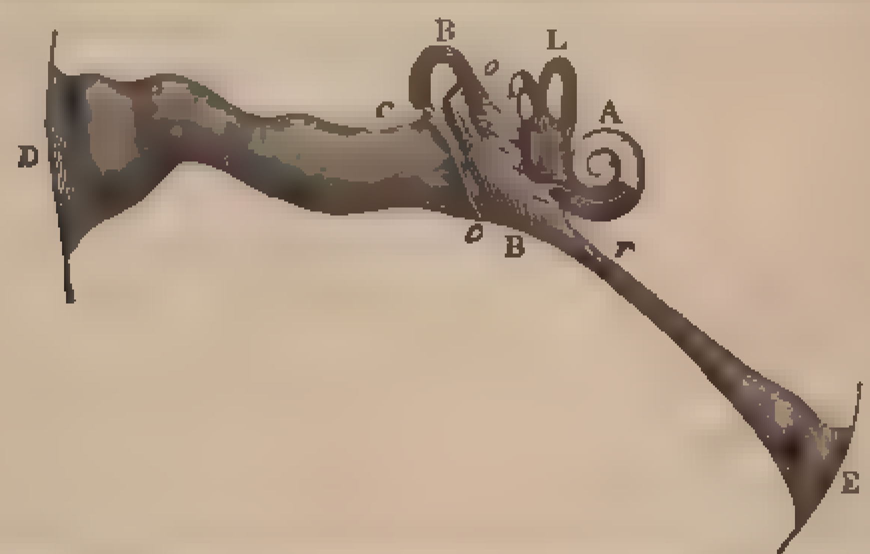

FIG. 7. The right ear (excluding the concha) seen from the front. *D* to *c* external auditory meatus; *c c*, tympanic membrane; *B*, the tympanum with the auditory ossicles in it; *B* to *E*, Eustachian tube; *A* labyrinth.

through which numerous small glands, secreting the *wax* of the ear, open.

The Tympanum, or drum-chamber of the ear (*B*, fig. 7), is an irregular cavity in the temporal bone, closed externally by the drum membrane. From its inner side the *Eustachian tube* (*B* to *E*) proceeds and opens into the pharynx, and the mucous membrane of that cavity is continued up the tube to line the tympanum; between this inside, and the skin of the external auditory meatus outside, is the proper tympanic membrane composed of connective tissue. The inner wall of the tympanum is bony except for two small apertures, the *oval* and *round foramens*, which lead into the labyrinth. During life the round aperture is closed by the lining mucous membrane, and the oval in another way, to be described presently. The *tympanic membrane*, *c c*, stretched like a drum-head across the outer side of tympanum, forms a shallow funnel with its concavity outwards. If a sheet of indian rubber be stretched

[1] Martin, Chap. xxiii.

over a ring and pulled down in the centre, its form will be very like that of the membrane in question. It is pressed by the external air on its exterior, and by air entering the tympanic cavity through the Eustachian tube on its inner side. If the tympanum were closed, these pressures would not be always equal when barometric pressure varied, and the membrane would be bulged in or out according as the external or internal pressure on it were the greater. On the other hand, were the Eustachian tube always open the sounds of our own voices would be extremely loud and disconcerting, so it is usually closed; but every time we swallow it is opened, and thus the air pressure in the cavity is kept equal to that in the external auditory meatus. By holding the nose, keeping the mouth shut, and forcibly expiring, air may be forced under pressure into the tympanum, and will be held in part imprisoned there until the next act of swallowing. On making a balloon ascent or going rapidly down a deep mine, the sudden and great change of aerial pressure outside frequently causes painful tension of the drum membrane, which may be greatly alleviated by frequent swallowing.

The Auditory Ossicles.—Three small bones lie in the tympanum, forming a chain from the drum membrane to the oval foramen. The external bone is the *malleus* or *hammer*; the middle one, the *incus* or *anvil*; and the internal, the *stapes* or *stirrup*. The malleus has an upper enlargement of *head*, which carries on its inner side an articular surface for the incus; below the head is a constriction, the *neck*, and below this two processes complete the bone; one, the *long* or *slender process*, is imbedded in a ligament which reaches from it to the front wall of the tympanum; the other process, the *handle*, reaches down between the mucous membrane lining the inside of the drum membrane and the membrane proper, and is firmly attached to the latter near its centre, and keeps the membrane dragged in there so as to give it its peculiar concave form, as seen from the outside. The incus has a body and two processes, and is much like a molar tooth with two fangs. On its body is an articular hollow to receive the head of the malleus; its short process is attached by ligament to the back wall of the tympanum; the long process is directed inwards to the stapes; on the tip of this process is a little knob, which represents a bone (*os orbiculare*) distinct in early life. The stapes is extremely like a stirrup, and its base (the footpiece of the stirrup) fits into the oval foramen, to the margin of which its edge is united by a fibrous membrane, allowing of a little play in and out.

From the posterior side of the neck of the malleus a ligament passes to the back wall of the tympanum this, with the ligament imbedding the slender process and fixed to the front wall of the tympanum, forms an antero-posterior *axial ligament*, on which the malleus can slightly rotate, so that the handle can be pushed in and the head out, and *vice versâ*. Connected with the malleus is a tiny muscle called the *tensor*

tympani; it is inserted on the handle of the bone below the axis of rotation, and when it contracts pulls the handle in and tightens the drum membrane. Another muscle (the *stapedius*) is inserted into the outer end of the stapes, and when it contracts fixes the bone so as to limit its range of movement in and out of the fenestra ovalis.

The Internal Ear.—The labyrinth consists primarily of chambers and tubes hollowed out in the temporal bone and enclosed by it on all sides, except for the oval and round foramens on its exterior, and certain apertures on its inner side by which blood-vessels and branches of the auditory nerve enter; during life all these are closed water-tight in one way or another. Lying in the *bony labyrinth* thus constituted, are membranous parts, of the same general form but smaller, so that between the two a space is left; this is filled with a watery fluid, called the *perilymph*; and the *membranous internal ear* is filled by a similar liquid, the *endolymph*.

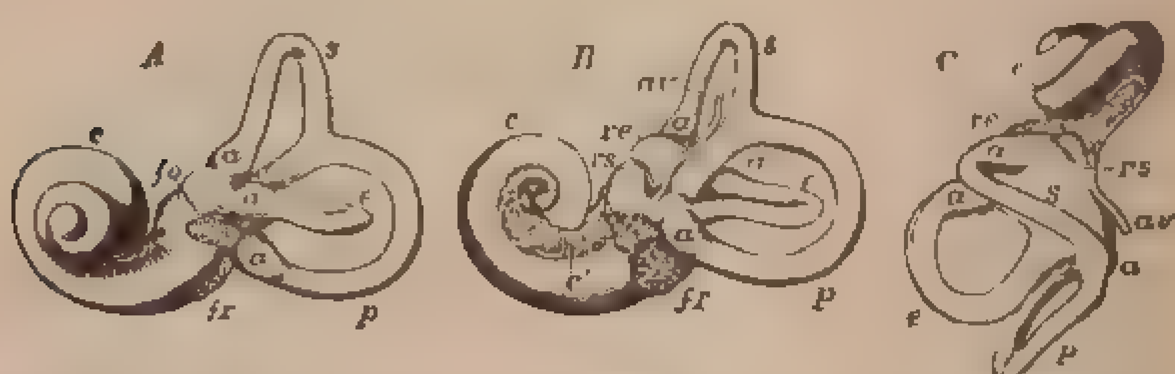

FIG 8. Casts of the bony labyrinth. *A*, left labyrinth seen from the outer side; *B*, right labyrinth from the inner side, *C*, left labyrinth from above, *fr*, round foramen; *fo*, oval foramen. *s*, *p*, *e*, semicircular canals, *a a a*, ampullæ, *c*, cochlea.

The Bony Labyrinth.—The bony labyrinth is described in three portions, the *vestibule*, the *semicircular canals*, and the *cochlea*; casts of its interior are represented from different aspects in fig. 8. The vestibule is the central part, and has on its exterior the oval foramen (*fo*) into which the base of the stirrup-bone fits. Behind the vestibule are three bony semicircular canals, communicating with the back of the vestibule at each end, and dilated near one end to form an *ampulla* (*a a a*). The horizontal canal lies in the plane which its name implies, and has its ampulla at the front end. The two other canals lie vertically, the anterior at right angles, and the posterior parallel, to the median antero-posterior vertical plane of the head. Their ampullary ends are turned forwards, and open close together into the vestibule; their posterior ends unite and have a common vestibular opening.

The bony cochlea is a tube coiled on itself somewhat like a snail's shell, and lying in front of the vestibule.

The Membranous Labyrinth.—The membranous vestibule, lying in

the bony, consists of two sacs communicating by a narrow aperture. The posterior is called the *utriculus*, and into it the membranous semicircular canals open. The anterior, called the *sacculus*, communicates by a tube with the membranous cochlea. The membranous semicircular canals much resemble the bony, and each has an ampulla; in most of their extent they are only united by a few irregular connective tissue bands with the periosteum lining the bony canals; but in the ampulla one side of the membranous tube is closely adherent to its bony protector; at this point nerves enter the former. The relations of the membranous to the bony cochlea are more complicated. A section through this part of the auditory apparatus shows that its osseous portion consists of a tube wound two and a half times (from left to right in the right ear and *vice versâ*) around a central bony axis, the *modiolus*. From the axis a shelf, the *lamina spiralis*, projects and partially subdivides the tube, extending farthest across in its lower coils. Attached to the outer end of this bony plate is the membranous cochlea (*scala media*), a tube triangular in cross-section and attached by its base to the outer side of the bony cochlear spiral. The spiral lamina and the membranous cochlea thus subdivide the cavity of the bony tube into an upper portion, the *scala vestibuli*, and a lower, the *scala tympani*. Between these lie the lamina spiralis and the membranous cochlea, the latter being bounded above by the membrane of Reissner and below by the basilar membrane. The inner edge of the lamina spiralis is thickened and covered with connective tissue, which is hollowed out so as to form a spiral groove (the *sulcus spiralis*) along the whole length of the membranous cochlea. The latter does not extend to the tip of the bony cochlea; above its apex the scala vestibuli and scala tympani communicate; both are filled with perilymph, and the former communicates below with the perilymph cavity of the vestibule, while the scala tympani abuts below on the round foramen, which, as has already been pointed out, is closed by a membrane. The membranous cochlea contains certain solid structures seated on the basilar membrane and forming the *organ of Corti*; the rest of its cavity is filled with endolymph, which communicates with that in the sacculus.

The Organ of Corti.—This contains the end organs of the cochlear nerves. Lining the sulcus spiralis are cuboidal cells; on the inner edge of the basilar membrane they become columnar, and these are succeeded by a row which bear on their upper ends a set of short stiff hairs, and constitute the *inner hair-cells*, which are fixed below by a narrow apex to the basilar membrane; nerve-fibres enter them. To the inner hair-cells succeed the *rods of Corti*. These rods are stiff and arranged side by side in two rows, leaned against one another by their upper ends so as to cover in a tunnel; they are known respectively as the *inner* and *outer rods*, the former being nearer the *lamina spiralis*. Each rod has a somewhat dilated base, firmly fixed to the basilar membrane; an expanded

head where it meets its fellow (the inner rod presenting there a concavity into which the rounded head of the outer fits); and a slender shaft uniting the two, slightly curved like an italic *S*. The inner rods are more slender and more numerous than the outer, their numbers being about 6,000 and 4,500 respectively. Attached to the external sides of the heads of the outer rods is the *reticular membrane*, which is stiff and perforated by holes. External to the outer rods come four rows of *outer hair-cells*, connected like the inner row with nerve fibres; their bristles project into the holes of the reticular membrane. Beyond the outer hair-cells is ordinary columnar epithelium, which passes gradually into cuboidal cells lining most of membranous cochlea. The upper lip of the sulcus spiralis is uncovered by epithelium, and is known as the *limbus laminæ spiralis*; from it projects the *tectorial membrane*, which extends over the rods of Corti and the hair-cells.

FIG. 9.—The epithelium at the point where the nerves enter an ampulla. *n*, nerves; *c*, superficial columnar epithelium; *sp*, fusiform cells; *h*, hairs; *b*, basal cells.

Nerve-Endings in the Semicircular Canals and the Vestibule. Nerves reach the ampulla of each semicircular canal, and, perforating its wall, enter the epithelium lining it, which is there several layers thick (fig. 9). Some of the cells (*sp*) are fusiform and have large nuclei: a slender *external process* runs from each to the cavity of the ampulla and is then continued as slender stiff hair (*h*), which projects into the endolymph. The deeper ends of these cells have been described as joining the terminal branches of nerve fibres, so that they must be regarded as *end organs*. In the *utricle* and *saccule* are somewhat similar structures, but collected among the hairs are minute calcareous particles, the *ear-stones* or *otoliths*.

§ 41. The sensations of sound are produced by vibrations in bodies which are communicated to the air environing such bodies, and these aerial vibrations in turn are extended to reach the auditory apparatus above described. The office of the concha and the external auditory meatus is to collect and convey these aërial waves, which at length strike upon the tympanum. When the waves follow one another uniformly, or periodically, the resulting sensation (if any) is a note; when the vibrations are aperiodic, it is a noise. In notes we recognise (1) loudness or intensity; (2) pitch; (3) quality or

timbre, or as it has been called, *tone colour*; a note of a given loudness and pitch produced by a trumpet and by a violin has a different character, an individuality in each case; this quality is its timbre.

The Functions of the Tympanic Membrane. If a stretched membrane, such as a drum-head, be struck, it will be thrown into periodic vibration and emit for a time a note of a determined pitch. The smaller the membrane and the tighter it is stretched, the higher the pitch of its note; every stretched membrane thus has a rate of its own at which it tends to vibrate, just as a piano or violin string has. When a note is sounded in the air near such a membrane, the alternating waves of aerial condensation and rarefaction will move it; and if the waves succeed at the vibrational rate of the membrane the latter will be set in powerful *sympathetic vibration*; if they do not push the membrane at the proper times, their effects will neutralise one another; hence such membranes respond well to only one note. The tympanic membrane, however, responds equally well to a large number of notes: at the least for those due to aerial vibrations of rates from 60 to 4,000 per second, running over eight octaves and constituting those commonly used in music. This faculty depends on two things: (1) the membrane is comparatively loosely and not uniformly stretched; (2) it is *loaded* by the tympanic bones.

The drum-membrane is in the form of a shallow funnel with its sides convex towards its cavity, in such a membrane the tension is not uniform but increases towards the centre, and it has accordingly no proper note of its own. Further, whatever tendency such a membrane may have to vibrate rather at one rate than another, is almost completely removed by 'damping' it; *i.e.* placing in contact with it something comparatively heavy and which yet has to be moved when the membrane does. This is effected by the tympanic bones, fixed to the drum-membrane by the handle of the malleus. Another advantage is gained by the damping; once a stretched membrane is set vibrating it continues so doing for some time; but if loaded, its movements cease almost as soon as the moving impulses. The dampers of a piano are for this purpose; and violin-players have to 'damp' with the fingers the strings they have used when they wish the note to cease. When the aerial waves cease the loaded drum-membrane comes to rest almost immediately, and is ready to respond to the next set of waves reaching it.

Functions of the Auditory Ossicles. When the air in the external auditory meatus is condensed it pushes in the handle of the malleus. This bone then slightly rotates on the axial ligament, and drags out the incus and with it the base of the stapes; the reverse occurs when air in the auditory passage is rarefied. Aerial vibrations thus set the chain of bones swinging, and pull out and push in the base of the stapes,

which sets up waves in the perilymph of the labyrinth, and these are transmitted through the membranous labyrinth to the endolymph. These liquids being chiefly water, and practically incompressible, the end of the stapes could not work in and out at the oval foramen, were the labyrinth elsewhere completely surrounded by bone: but the membrane covering the round foramen bulges out when the base of the stapes is pushed in, and *vice versâ*; and so allows of waves being set up in the labyrinthic liquids. These correspond in period and form to those in the auditory meatus; their amplitude is determined by the extent of the vibrations of the drum membrane.

The form of the tympanic membrane causes it to transmit to its centre, where the malleus is attached, vibrations of its lateral parts in diminished amplitude but increased power, so that the tympanic bones are pushed only a little way but with considerable force. Its area, too, is about twenty times as great as that of the oval foramen, so that force collected on the larger area is, by pushing the tympanic bones, all concentrated on the smaller. The ossicles also form a bent lever, of which the fulcrum is at the axial ligament, and the effective outer arm of this lever is about half as long again as the inner, and so the movements transmitted by the drum-membrane to the handle of the malleus are communicated with diminished range, but increased power, to the base of the stapes.

Ordinarily sound waves reach the labyrinth in this way through the tympanum, but they may also be transmitted through the bones of the head in general; if the handle of a vibrating tuning-fork be placed on the vertex, for example. Such sounds seem to have their origin in the head itself. Similarly, when a vibrating body is held between the teeth, sound reaches the end organs of the auditory nerve through the skull-bones, and persons who are deaf from disease or injury of the tympanum can thus be made to hear, as with the *audiphone*. Of course if deafness be due to disease of the proper nervous auditory apparatus no device can make the person hear.

Function of the Cochlea.—We have reason to believe that in the ear there is an apparatus adapted for sympathetic resonance, by which we recognise different musical tone colours; the minute structure of the membranous cochlea is such as to lead us to look for it there. An old view was that the rods of Corti, which vary in length, were like so many piano strings, each tending to vibrate at a given rate and picking out and responding to pendular aerial vibrations of its own period, and exciting a nerve which gave rise to a particular tone sensation. When the labyrinthic fluids were set in non-pendular vibrations, the rods of Corti were thought to analyse these into their pendular components, all rods of the vibrational rate of these being set in sympathetic movement, but that rod most whose period was that of the primary partial tone; this would determine the pitch of the note, and the less marked sensa-

tions due to the others affected would give it its timbre. The rods, however, do not differ in size sufficiently to account for the range of notes which we hear; they are absent in birds, which undoubtedly distinguish different musical notes: and the nerve-fibres of the cochlea are not connected with them but with the hair-cells.

On the whole it seems probable that the basilar membrane is to be looked upon as the primary arrangement for sympathetic resonance in the ear. It increases in breadth twelve times from the base of the cochlea to its tip (the less width of the lamina spiralis at the apex more than compensating for the less size of the bony tube there) and is stretched tight across, but loosely in the other direction. A membrane so stretched behaves as a set of separate strings placed side by side, somewhat as those of a harp but much closer together; and each string would vibrate at its own period without influencing much those on each side of it. Probably, then, each transverse band vibrates to simple tones of its own period, and excites the hair-cells which lie on it, and through them the nerve-fibres. Perhaps the rods of Corti, being stiff, and carrying the reticular membrane, rub that against the upper ends of the hair-cells which project into its apertures and so help in a subsidiary way, each pair of rods being especially moved when the band of basilar membrane carrying it is set in vibration. The tectorial membrane is probably a 'damper;' it is soft and inelastic, and suppresses the vibrations as soon as the moving force ceases.

Function of the Vestibule and Semicircular Canals.—Many noises are merely spoiled music; they are due to tones so combined as not to give rise to periodic vibrations; these are probably heard by the cochlea. If a single violent air-wave ever cause a sound sensation (which is doubtful, since any violent push of an elastic substance, such as the air, will cause it to make several rebounds before coming to rest) we perhaps hear it by the vestibule; the otoliths, there in contact with the auditory hairs, are imbedded in a tenacious gummy mass quite distinct from the proper endolymph, and are not adapted for executing regular vibrations, but they might yield to a single powerful impulse and transmit it to the hair-cells, and through them stimulate the nerves. There is reason to believe that the semicircular canals have nothing to do with hearing.[1]

§ 42. All bodies are liable to produce sound, but the sounds differ greatly in degree and kind. The metals are the most resonant; after these come wood, stones, earthy bodies, a hard and elastic texture being the property requisite for sound. Gases and liquids ordinarily give little sound except as impinged upon by solids. The sound of thunder is the best example of a pure aerial sound.

[1] Martin, *op. cit.*

§ 43. We remarked that the sense of smell was more perfect in some of the lower animals than in man. The same is true of hearing, as for instance in the owl.[1] The vertebrates all but universally have organs of hearing, the amphioxus however furnishing the exception. Among the invertebrates we find organs of this sort variously developed and sometimes not at all. For example the earthworm has no auditory apparatus, nor in fact any organs of special sense save touch, so far as we are yet able to make out. On the other hand we find organs of hearing in the crustacea and in insects, as grasshoppers, crickets, and locusts.[2] But the lower down we proceed in the zoological scale the more rudimentary do these organs become, and correspondingly it is to be supposed that the functional properties become much simplified; so that the sense of hearing must be very different in these lower species from what it is in man. It may not be less acute, but its susceptibility to variety of sounds and to delicate variations is likely to be much more limited in range. In those associations which have intellectual relations of course these inferior animals are on a vastly lower level, fixed by their generally simple intellectual development. The particular exhibitions of special sense development in the inferior animal kingdom we need not stop to consider, nor shall we concern ourselves with tracing in detail the course of that development. Suffice it to say that all the special senses are found to have their beginnings in modifications of the integument, gradually becoming more and more complicated until the full perfection of the specialised organs is reached. This line of investigation, as well as that which deals with the method of action of special sense organs, furnishes proof that all the senses of conscious beings are but modified forms of tactile or contact sensibility.

§ 44. Sensations of hearing have very marked quality relations, and are equally important on account of their quantity relations. They develop various degrees of pleasure and pain, and they are our exceedingly valuable ministers to the growth of intellectual power and the formation of its products. They may be divided roughly into *Sounds in General*, including the general characteristics of sound in quality, intensity, volume; *Musical Sounds*, in order to appreciate which there must be a susceptibility to pitch; and *Articulate Sounds*, which perform the offices of language. Of these classes the two last appear to be differentiations from the first.

[1] Bastian's *The Brain as Organ of Mind*, Chap. XIII.
[2] Von Siebold, Hensen.

It should be said that all sounds have a greater or less musical quality. As before in treating of other senses, we will here also catalogue a few groups of auditory sensations which have relation to the qualities of the feeling.

§ 45. *Sweet Sounds.*—We term those sounds which are characteristically pleasant or agreeable, *sweet* sounds. The pleasurable effect depends largely upon the musical quality or harmony of the sounds; largely also upon the agreeable associations connected with the sounds. The sensations are either acute or massive, more generally acute. The pleasurable quality is considerably dependent also upon the intensity or volume of the sound and the variations in respect to quantity. Sometimes greater intensity or volume increases the enjoyable effect, sometimes diminishes it; but too great intensity or volume, if long continued, is usually adverse to pleasurable experiences. Concordant sounds are sweet sounds.

Harsh Sounds.—As opposed to *sweet*, the characteristically painful sounds are *harsh*. The rattle or clash of machinery, the gnashing of teeth, the roar of beasts, the fall of rocks, give harsh sounds. The effect is disturbing as opposed to the soothing or tonic influence of sweet sounds. Shrill sounds are another variety of painful auditory experiences which are allied to and may be considered a variety of the harsh. Shrill sounds are acute, harsh sounds proper may be either acute or voluminous. Discordant sounds are a variety of harsh sounds.

§ 46. Differences in sounds, according to their relative *loudness* and *faintness*, are of considerable importance in sensation, as also differences relating to *volume* and *acuteness*. This has been remarked in the preceding section. *Concords* and *discords* are of essential consequence in music. The discrimination of *pitch*, or the *acuteness* or *graveness* of sounds, lies at the foundation of musical appreciation. Pitch is measured by the rate of vibration of the sounding body: the gravest sound audible resulting from sixteen vibrations a second, the most acute from 38,000 a second.[1] At the upper limit of hearing there is a very decided difference in persons as regards ability to hear—as much as two octaves. It is said that the sound of a cricket is inaudible to some persons, but graver sounds can readily be distinguished. And always there is much difference between individuals as regards nicety of discriminations in variations of pitch. In music tones and semi-

[1] Helmholz.

tones are the intervals recognised, but much finer separation can be made by practised ears.

§ 47. Differences in *timbre* are differences in quality arising from differences in resonant substances. The sound of the violin differs from that of the flute, although intensity and pitch be the same. Vibrating substances have their individualities in manner of affecting the sense organs. These differences of timbre arise from differences in overtones. A vibrating body, a string for instance, vibrates along its whole length, giving thus a general or fundamental tone; it also vibrates in parts or sections, thus giving auxiliary or additional *over*tones, thereby varying the general effect upon the ear. It must not be understood that these waves of vibration are discrete; they fuse and form one general complex disturbance. The fundamental tone determines the pitch, but the timbre depends upon the number, the quality, and relative prominence of the overtones.

§ 48. In articulate sounds, there exist the differences already noted as applying to sounds in general and to musical sounds. The differences in articulation are effected by varying the relations of the parts of the vocal organs to each other and to the current of air passing through them, thus continually altering the extent, number, and quality of the vibrations produced. There are two general divisions of articulate sounds, namely *Vowels* and *Consonants*, having reference to degrees and varieties of articulateness and ignoring musical qualities. From combinations of these language is constructed.

f. *Ocular Contact, or Sight.*

§ 49. When certain particles of matter in a certain manner of motion impinge upon the termini of certain afferent nerves which are situated within the eye, sensations ensue which we term sensations of sight or vision. The eye is the organ of sight, and like the ear is an exceedingly complicated apparatus, of which a detailed description will be desirable in this place.

The following descriptions are quoted from 'The Human Body,' by Martin (the larger and the smaller work).

§ 50. *The Visual Apparatus* consists of nervous tissues immediately concerned in giving rise to sensations, supported, protected, and nourished by other parts. Its essential parts are, (1) *the retina*, a thin membrane lying in the eyeball and containing microscopic elements which are so acted upon by light as to stimulate (2) *the optic nerve*; this nerve ends

(3) in a part of the brain (*visual centre*) which when stimulated arouses in our consciousness a feeling or *sensation of sight*. The visual centre may be excited in very many ways, and quite independently of the optic nerve or the retina, as is frequently seen in delirious persons, in whom inflammation or congestion of the brain excites directly the visual centre and gives rise to visual hallucinations.

Usually, however, the cerebral visual centre is only excited through the optic nerve, and the optic nerve only by light acting upon the retina. The eyeball, containing the retina, is so constructed that light can enter it, and so placed and protected in the body that as a general thing no other form of energy can act upon it so as to stimulate the retina. Under exceptional circumstances we may have sight-sensations when no light reaches the eye; anything which stimulates the retina, so long as it is connected by the optic nerve with the cerebral visual centre, will cause a sight-sensation. A severe blow on the eye, even in complete darkness, will cause the sensation of a flash of light; the compression of the eyeball excites the retina, the retina excites the optic nerve, the optic nerve the visual nerve centre, and the result is a sight sensation.[1]

The Eye Socket. -The eyeball is lodged in a bony cavity, *the orbit*, open in front. Each orbit is a pyramidal chamber containing connective tissue, blood vessels, nerves, and much fat; the fat forms a soft cushion on which the back of the eyeball rolls.

The Eyelids are folds of skin, strengthened by cartilage and moved by muscles. Opening along the edge of each eyelid are from twenty to thirty minute glands, called the Meibomian follicles. Their secretion is

[1] The fact that sight-sensations may be aroused quite independently of all light acting upon the eye is paralleled by similar phenomena in regard to other senses, and is of fundamental psychological and metaphysical importance. That a blow on the closed eye gives rise to a vivid light-sensation, even in the absence of all actual light, proves that our sensation of light is quite a different thing from light itself. The visual sensory apparatus, it is true, is so constructed and protected that of all the forces of nature, light is the one which far most frequently stimulates it. But as regards the peculiarity in the quality of the sensation which leads us to classify it as 'a visual sensation,' that peculiarity has nothing to do with any property of light. The visual nerve-centre when stimulated causes a sight-sensation, whether it has been excited by light, or by a blow, or by electricity. Similarly the auditory brain-centre gives us a sound-sensation when stimulated by actual external sound-waves, or by a blow on the ear, or by disease of the auditory organ. One kind of energy, *light*, excites more often than any other the visual nerve-apparatus; another, *sound*, the auditory nerve-apparatus; a third, *pressure*, the touch nerve-organs. Hence we come to associate light with visual sensations, and to think of it as something like our sight-feelings; and to imagine sound as something like our auditory sensations; and so forth. As a matter of fact both light and sound are merely movements of ether or air; it is our own stimulated nerve-centres which produce visual and auditory sensations; the ethereal or aerial vibrations merely act as the stimuli which arouse the nervous apparatus. Martin.

sometimes abnormally abundant, and then appears as a yellowish matter along the edges of the eyelids, which often dries in the night and causes the lids to be glued together in the morning. The *eyelashes* are curved hairs, arranged in one or two rows along each lid, and helping to keep dust from falling into the eye; and, when the lids are nearly closed, to protect it from a dazzling light.

The Lachrymal Apparatus consists of the tear gland in each orbit, of ducts which carry its secretion to the upper eyelid, and of canals by

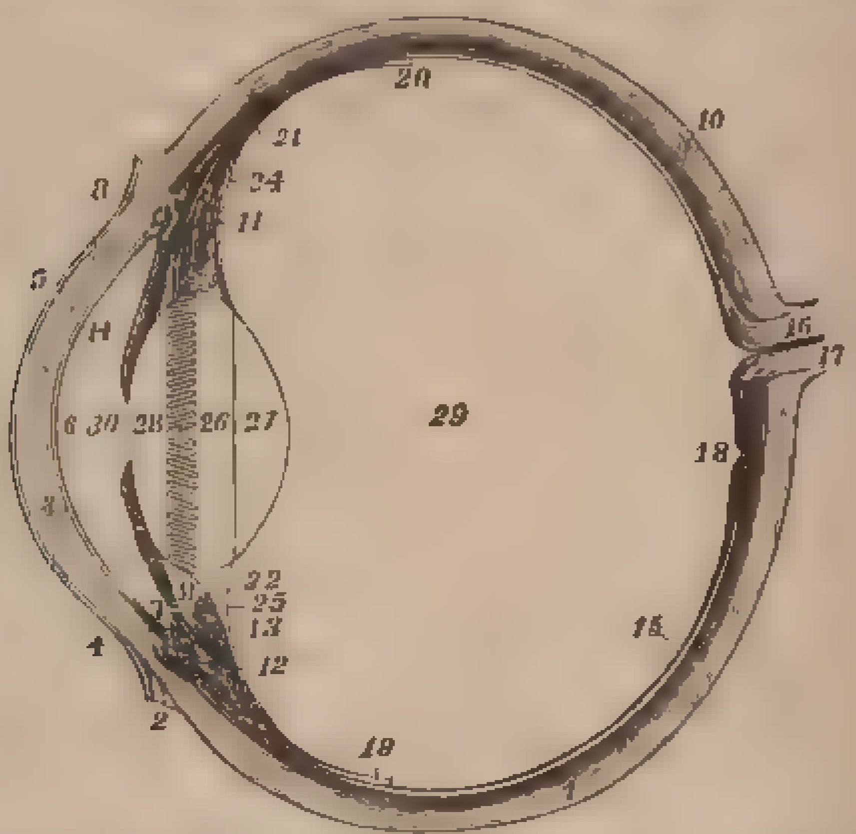

FIG 10. The left eyeball in horizontal section from before back. 1, sclerotic; 2, junction of sclerotic and cornea; 3, cornea; 4, 5, conjunctiva; 6, posterior elastic layer of cornea; 7, ciliary muscle; 10, choroid; 11, 13, ciliary processes; 14, iris; 15, retina; 16, optic nerve; 17, artery entering retina in optic nerve; 18, fovea centralis; 19, region where sensory part of retina ends; 22, suspensory ligament; 23 is placed in the canal of Petit, and the line from 25 points to it; 24, the anterior part of the hyaloid membrane; 26, 27, 28, are placed on the lens; 28 points to the line of attachment around it of the suspensory ligament; 29, vitreous humour; 30, anterior chamber of aqueous humour; 31, posterior chamber of aqueous humour.

which this, unless when excessive, is carried off from the front of the eye without running down over the face. The *lachrymal* or *tear gland*, about the size of an almond, lies in the upper and outer corner of the orbit. It is a compound racemose gland, from which twelve or fourteen ducts run and open at the outer corner of the upper eyelid on its inner surface. The secretion there poured out is spread evenly over the exposed part of the eye by the movements of winking, and keep it moist; finally it is drained off by two *lachrymal canals*, one of which opens by a small pore on an elevation, or papilla, near the inner end of the margin of each eyelid. The aperture of the lower canal can be readily seen by examining its papilla in front of a looking-glass. The canals run inwards and open into the *lachrymal sac*, which lies just outside the nose, in a hollow where the lachrymal and superior maxillary bones meet. From

this sac the *nasal duct* proceeds to open into the nose chamber below the inferior turbinate bone.

Tears are constantly being secreted, but ordinarily in such quantity as to be drained off into the nose, from which they flow into the pharynx and are swallowed. When the lachrymal duct is stopped up, however, their continual presence makes itself unpleasantly felt and may need the aid of a surgeon to clear the passage. In *weeping* the secretion is increased, and then not only more of it enters the nose, but some flows down the cheeks. The frequent swallowing movements of a crying child, sometimes spoken of as 'gulping down his passion,' are due to the need of swallowing the extra tears which reach the pharynx.

The Globe of the Eye is on the whole spheroidal, but consists of segments of two spheres (see fig. 10), a portion of a sphere of smaller radius forming its anterior transparent part, and being set on to the front of its posterior segment, which is part of a larger sphere. In general terms it may be described as consisting of three *coats* and three *refracting media.*

The outer coat 1 and 3, fig. 10, consists of the *sclerotic* and the *cornea*, the latter being transparent and situated in front; the former is opaque and white, and covers the back and sides of the globe and part of the front, where it is seen between the eyelids as the *white* of the eye. Both are tough and strong, being composed of dense connective tissue.

The second coat consists of the *choroid*, 9, 10, and the *iris*, 14. The *choroid* consists mainly of blood vessels supported by loose connective tissue, which in its inner layers contains many dark brown or black pigment granules. Towards the front of the eyeball, where it begins to diminish in diameter, the choroid separates from the sclerotic and turns in to form the *iris*, or that coloured part of the eye which is seen through the cornea; in the centre of the iris is a circular aperture, the *pupil*, through which light reaches the interior of the eyeball.

The third or innermost coat of the eye, *the retina*, 15, is its essential portion, being the part in which the light produces those changes that give rise to nervous impulses in the optic nerve. It lines the posterior half of the eyeball.

The Microscopic Structure of the Retina is very complex; although but $\frac{1}{80}$ inch in thickness it presents ten distinct layers.

Beginning (fig. 11) on its front or inner side we find, first, the *internal limiting membrane*, 1, a thin structureless layer. Next comes the *nerve-fibre layer*, 2, formed by radiating fibres of the optic nerve; third, the *nerve-cell layer*, 3; fourth, the *inner molecular layer*, 4, consisting partly of very fine nerve-fibrils, and largely of connective tissue; fifth, the *inner granular layer*, 5, composed of nucleated cells, with a small amount of protoplasm at each end, and a nucleolus. These *granules*, or at any rate the majority of them, have an *inner process* running to the inner molecular layer, and an outer running to, 6, the *outer molecular layer*, which is thinner than the inner. Then comes

seventh, the *rod and cone fibre layer*, 7, or *outer granular layer*, composed of thick and thin fibres, on each of which is a conspicuous nucleus with a nucleolus. Next is the thin *external limiting membrane*, 8, perforated by apertures through which the *rods and cones*, 9, of the ninth layer join the fibres of the seventh. Outside of all, next the choroid, is the *pigmentary layer*, 10. The nerve fibres are believed to be continuous with the rods and cones. Light entering the eye passes through the transparent retina until it reaches the rods and cones and excites these, and they stimulate the nerves.

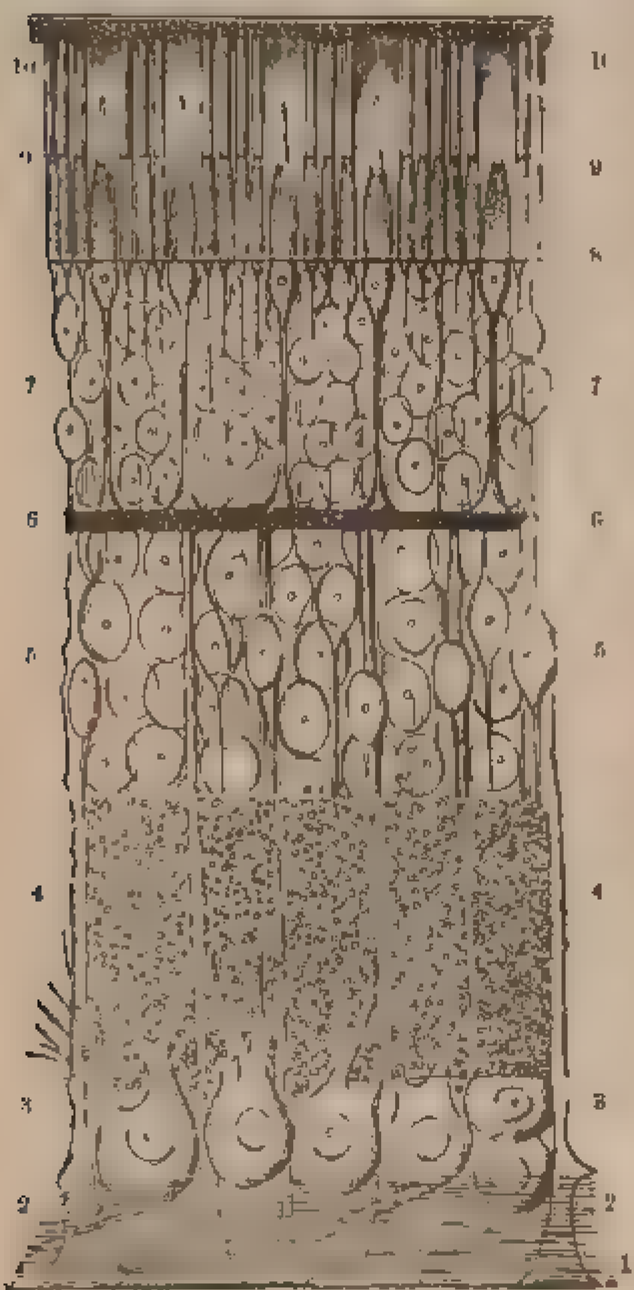

FIG. 11. A section through the retina from its anterior or inner surface, 1, in contact with the hyaloid membrane, to its outer, 10, in contact with the choroid: 1, internal limiting membrane; 2, nerve fibre layer; 3, nerve-cell layer; 4, inner molecular layer; 5, inner granular layer; 6, outer molecular layer; 7, outer granular layer; 8, external limiting membrane; 9, rod and cone layer; 10, pigment-cell layer.

The action of the light is probably in the first instance chemical. The rods are stained by a purple substance, which is bleached by light and regenerated in the dark. In the healthy eye the purple is reproduced nearly as fast as destroyed, by the pigment-cells of the retina. Parts of the retina which contain none of this *vision purple* can see, but they may possess uncoloured substances which are changed by light.

Light consists of vibrations in an ether which pervades space. An object which sets up no waves in the ether does not excite the visual nervous apparatus, and appears black; an object which sets up ethereal vibrations capable of exciting the rods and cones of the retina appears white or coloured when we look at it. The ethereal vibrations enter the eye through the cornea, pass on through the pupil, and reach and stimulate the retina.

The Refracting Media of the Eye are three in number: (1) the *aqueous humour*; (2) the *crystalline lens*; (3) the *vitreous humour*. Their relative positions are shown in fig. 10. These media act like a convex lens, such as a common burning-glass, and bend the rays of light which pass through them (fig. 12), so that all those which start from one point of an

external object meet again in a *focus* on one point of the retina. In this way a small and inverted image of the things at which we look is formed on the retina, and stimulates its rods and cones.

Accommodation. In the healthy eyeball the crystalline lens is controlled by muscles which change its convexity, making this greater when we look at near objects and less when we look at distant objects. When the lens is very convex we cannot see a distant object distinctly, and when it is less convex we only dimly see a near object. For example, standing at a window behind a lace curtain we can *look at* the curtain and see its threads plainly, but while so doing we only see indistinctly houses on the other side of the street; because the convexity of the lens is then such as to focus light from the near object on the retina, and not that from the distant. We can, however, 'look at' the houses over the way and see them plainly; but then we no longer see the curtain distinctly, because the lens has so changed its form as to focus light from the far object on the retina, instead of light from the near. The power of changing the form of the lens according as near or distant objects are looked at is called '*accommodation.*'

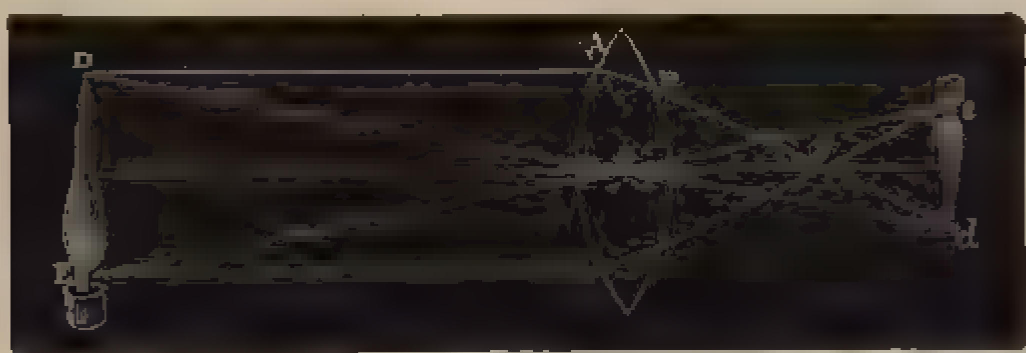

FIG. 12. Illustrating the formation behind a convex lens of a diminished and inverted image of an object placed in front of it.

Short Sight and Long Sight.—In the healthy eye the range of accommodation is very great, allowing light from objects infinitely distant up to that proceeding from those only about eight inches in front of the eye to be brought to a focus on the retina. In the natural healthy eye parallel rays of light meet on the retina when the muscles controlling the crystalline lens are at rest and the lens is at its flattest. Such eyes are *emmetropic*. In other eyes the eyeball is too long from before back; in the resting state parallel rays meet in front of the retina. Persons with such eyes cannot see distant objects distinctly without the aid of diverging (concave) spectacles; they are *short-sighted* or *myopic*. Or the eyeball may be too short from before back; then, in its resting state parallel rays are brought to a focus behind the retina. To see even distant objects, such persons must therefore use muscular effort to increase the converging power of the lens; and when objects are near they cannot, with the greatest effort, bring the rays proceeding from them to a focus soon enough. To get distinct retinal images of near objects,

they therefore need converging (convex) spectacles. Such eyes are called *hypermetropic*, or in common language *long sighted*.[1]

Light only excites the retina when it reaches its nerve end organs, the rods and cones. Visual sensations are not aroused when it falls direct on the fibres of the optic nerve. This is shown by the fact that where this nerve enters is a retinal part possessing only nerve-fibres, and this part is blind. Purkinje's experiment demonstrates that those changes which form the link between light and nervous impulses, occur in the rods and cones, that is, in the outer part of the retina.

Impressions on the Retina. An impression made on the retina is not always momentary, but may last for a while after the cause, as a light or bright object, has been removed. After the retina has been in the dark for a while it is more excitable, and of course after being exposed to a bright light for a while it is much less excitable. In other words, it is much more active after taking rest. An impression on the retina generally lasts from $\frac{1}{30}$th to $\frac{1}{4}$th of a second An electric spark, which is itself of very short duration, may make so powerful an impression on the retina, and it will remain so long, that the spark will be visible. To show how persistent the impression is, it is only necessary to take a round piece of card having one side black and the other white, and rotate it, when only continuous dark bands will be seen If a red spot be painted on the face of the disc it will appear, when the latter is rotated, like a red band, showing that the impression made by the spot is continuous. Each impression made upon the retina is here confounded with those which rapidly follow it. Another method of exhibiting the fact of this persistent sensation is by gazing steadily for a moment or two at a bright light, then looking at once into a dark room, when the image of the bright light will be distinctly seen This shows that the original image has not yet faded from the retina. Several well-known toys are based upon this principle, one called the wheel of life, or the thaumatrope, being familiar to almost all. A ready mode of illustrating the same effect is in the rapid whirling of a stick lighted at one end, which appears like a ring of fire.[2]

The Intensity of Visual Sensations Light considered as a form of energy may vary in quantity, physiologically, also, we distinguish quantitative differences in light as degrees of brightness, but the connection between the intensity of the sensation excited and the quantity of energy represented by the stimulating light is not a direct one. In the first place some rays excite our visual apparatus more powerfully than others; a given amount of energy in the form of yellow light, for example, causes more powerful visual sensations than the same quantity of energy in the

[1] Martin [2] Dunglison's *Physiology*

form of violet light. The ultra-violet rays only become visible, and then very faintly, when all others are suppressed; but if they be passed through some fluorescent substance such as an acid solution of quinine sulphate, which, without altering the amount of energy, turns it into ethereal oscillations of a longer period, then the light becomes readily perceptible.

Even with light-rays of the same oscillation period, our sensation is not proportional to the amount of energy in the light; to the amount of heat, for example, to which it would give rise if all transformed into it. If objective light increase gradually in amount our sensation increases also, up to a limit beyond which it does not go, no matter how strong the light becomes; but the increase of sensation takes place far more slowly than that of the light.[1]

The Localising Power of the Retina.—As already pointed out, a necessary condition of seeing definite objects, as distinguished from the power of recognising differences of light and darkness, is that all light

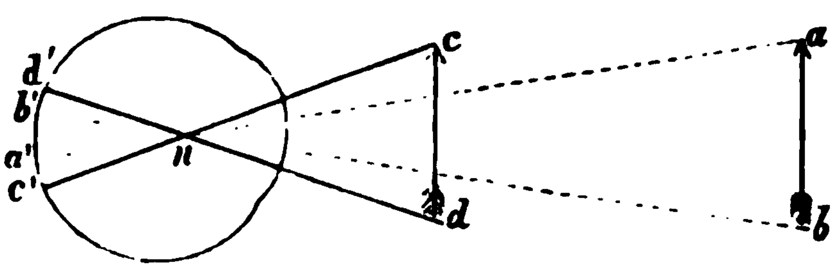

FIG. 13.

entering the eye from one point of an object shall be focussed on one point of the retina. This, however, would not be of any use had we not the faculty of distinguishing the stimulation of one part of the retina from that of another part. This power the visual apparatus possesses in a very high degree; while with the skin we cannot distinguish from one, two points touching it less than 1 mm. ($\frac{1}{25}$ inch) apart, with our eyes we can distinguish two points whose retinal images are not more than ·004 mm. (·00016 inch) apart. The distance between the retinal images of two points is determined by the 'visual angle' under which they are seen; this angle is that included between lines drawn from them to the nodal point of the eye. If a and b (fig. 13) are two points, the image of a will be formed at a' on the prolongation of the line a n joining a with the node, n. Similarly the image of b will be formed at b'. If a and b still remaining the same distance apart be moved nearer the eye to c and d, then the visual angle under which they are seen will be greater and their retinal images will be farther apart, at c' and d'. If a and b are the highest and lowest parts of an object, the distance between their retinal images will then depend, clearly, not only on the size of the object, but on its distance from the eye; to know the discriminating power of the retina we must therefore measure the visual angle in each case. In the fovea centralis

[1] Martin.

two objects seen under a visual angle of 50 to 70 seconds can be distinguished from one another: this gives for the distance between the retinal images that above mentioned, and corresponds pretty accurately to the diameter of a cone in that part of the retina. We may conclude, therefore, that when two images fall on the same cone or on two contiguous cones they are not discriminated; but that if one or more unstimulated cones intervene between the stimulated, the points may be perceived as distinct. The diameter of a rod or cone, in fact, marks the anatomical limit up to which we can by practice raise our acuteness of visual discrimination; and in the yellow spot which we constantly use all our lives in looking at things which we want to see distinctly, we have educated the visual apparatus up to about its highest power. Elsewhere on the retina our discriminating power is much less, and diminishes as the distance from the yellow spot increases. This is partly due, no doubt, to a less sensibility of those retinal regions, such as, by other facts, is proved to exist, but in part no doubt is also due to a want of practice. The more peripheral the retinal region the less we have used it for such purposes. It is probable, therefore, that outlying portions of the retina are capable of education to a higher discriminating power, just as we shall find the skin to be for tactile stimuli.

While we can tell the stimulation of an upper part of the retina from a lower, or a right region from a left, it must be borne in mind that we have no direct knowledge of which is upper or lower or right or left in the ocular image. All our visual sensations tell us is that they are aroused at different points, and nothing at all about the actual positions of these on the retina. There is no other eye behind the retina looking at it to see the inversion of the image formed on it. Suppose I am looking at a pane in a second-story window of a distant house: its image will then fall on the fovea centralis; the line joining this with the pane is called the *visual axis*. The image of the roof will be formed on a part of the retina below the fovea, and that of the front door above it. I distinguish that the images of all these fall on different parts of the retina in certain relative positions, and have learnt by the experience of all my life, that when the image of anything arouses the sensation due to excitation of part of the retina below the fovea the object is above my visual axis, and *vice versâ*, similarly with right and left. Consequently I interpret the stimulation of lower retinal regions as meaning high objects, and of right retinal regions as meaning left objects, and never get confused by the inverted retinal image about which directly I know nothing. A new-born child, even supposing it could use its muscles perfectly, could not seize a reachable object which it saw, it would not yet have learnt that attaining a point exciting that part of the retina above the fovea, meant reaching a position in space below the visual axis; but very soon it learns that things near its brow, that is *up*, excite certain visual sensations, and objects below its eyes

others, and learns to interpret retinal stimuli so as to localise accurately the direction, with reference to its eyes, of outer objects, and never thenceforth gets puzzled by retinal inversion.

Colour Vision.—Sunlight reflected from snow gives us a sensation which we call *white.* The same light sent through a prism and reflected from a white surface excites in us no *white* sensation but a number of colour sensations, gradating insensibly from red to violet, through orange, yellow, green, blue-green, blue, and indigo. The prism separates from one another light-rays of different periods of oscillation, and each ray excites in us a coloured visual sensation, while all mixed together, as in sunlight, they arouse the entirely different sensation of white. If the light fall on a piece of black velvet we get still another sensation, that of black, in this case the light-rays are so absorbed that but few are reflected to the eye, and the visual apparatus is left at rest. Physically black represents nothing: it is a mere zero—the absence of ethereal vibrations; but in consciousness, it is as definite a sensation as white, red, or any other colour. We do not feel blackness or darkness except over the region of the possible visual field of our eyes. In a perfectly dark room we only feel the darkness in front of our eyes, and in the light there is no such sensation associated with the back of our heads or the palms of our hands, though through these we get no visual sensations. It is obvious, therefore, that the sensation of blackness is not due to the mere absence of luminous stimuli but to the unexcited state of the retinas, which are alone capable of being excited by such stimuli when present. This fact is a very remarkable one, and is not paralleled in any other sense. Physically, complete stillness is to the ear what darkness is to the eye, but silence impresses itself on us as the absence of sensation, while darkness causes a definite feeling of blackness.'[1]

§ 51. The visibility of objects depends upon their susceptibility to, and their ability to be influenced by, that peculiar mode of motion we call light. Certain bodies are self-luminous; of these the sun is the most important. The vast majority of separate bodies with which we have to deal in our experience are visible only by reflecting the rays they receive from the self-luminous. This reflection is either *mirror reflection*, which merely discloses the body from which the light comes, or *reflection of visibility*, which pictures the reflecting surface, the light being broken up and sent forth in all directions in the same manner as from a self-luminous body. Visible surfaces, under the latter sort of reflection, receive light from the sun, absorb and re-issue it; in mirror reflection a new direction is simply given to the rays.

[1] *The Human Body*, Martin. Published by Henry Holt & Co., New York.

§ 52. Bodies are opaque or transparent in all degrees. Translucent bodies are those through which light is transmitted, but through which no objects are seen. As bodies become more transparent they grow less visible; perfect transparency reflects no light. The air is relatively transparent, though not perfectly so; water in small quantities when pure is nearly transparent. Opaque bodies vary as to their ability to diffuse light. Some, as chalk and white sand, emit a large quantity, while others, as charcoal, absorb and retain nearly all they receive. So also bodies have different capacities of decomposing light, retaining some and reflecting others of its constituent motions. Out of these facts arise those differences of experience which we indicate by the terms *colour* and *lustre*.

§ 53. It should be observed that the two organs of sight, like the two organs of hearing, act as one in their normal state, and present to the mind a single and not a double sense of objects.

§ 54. In the animal kingdom there are extremes of perfection of the ocular sensibility. In the case of birds the power of vision is generally far superior to that of man and to that of other animals. Among the invertebrates the beginning of sight organs is found in aggregations of pigment which become more than usually sensitive to light. These occur in the oyster, and in the eye specks of certain worms. In insects the usual apparatus is developed to a high degree, as also some of the mollusks.[1]

§ 55. As regards pleasure and pain the sensations of sight are not so remarkable in their original action as those of the other sensations we have been considering. The pleasures and pains of sight are predominantly representative and dependent upon intellectual associations, and these sensations contribute more to intellectual life than they do to emotional except through the cognitive activities. It is hence very difficult to group pleasurable and painful sights under any other heads than pleasurable and painful sights. We are not able to form such classes of these sensations according to agreeable or unpleasant qualities as we formed of sensations of touch, taste, smell, and hearing. However, according to quality, we can take note of three groups of which the second and third are differentiations from the first.

§ 56. *Light in General.*—There is a stimulating and agreeable quality in sensations of light in general as opposed to darkness, and often to a powerful extent. The feeling may be either acute or

[1] Bastian's *The Brain as the Organ of Mind*, Chaps. III., XIII.

massive according as the light is concentrated or diffused. The sunshine, the fire, the gas-light are cheering unless the light is too intense. We do not become satiated with the pleasures of light as soon as we do with the pleasures of other sensations. Their enjoyment after an interval of darkness is very marked and piquant.

Colours.—Different colours produce different sensations. Blue and green are usually mild, soft, and restful in their effects; red is exciting, fiery, pungent, and more frequently painful. This effect, however, is probably due to its rarity as compared with the other colours instanced. Here, as elsewhere, in connection with visual sensations the intellectual associations determine in great measure the pleasurability.

Lustres.—The pleasure of lustre is greater than that of colour alone. The finer woods when polished, stones, ivory, bone, silk, pearl, the human skin, the shining hair, the eye itself, the moistened leaf—all attest the agreeableness of lustre. The most characteristic effect of lustrous bodies is to sparkle. This effect is due to the occurrence of bright spots in the midst of darkness. Lustrous bodies have a mirror surface, and reflect the sun's rays as does the mirror. The opposite of *lustrous* is *dull*.

§ 57. There is a very great variety of sensations, of immense importance in cognition, which arise from differences in the modes of those motions which give the sensation of light. These differences are affected also by the movements of the ocular apparatus itself. From the two we get all the multiplicity and multiformity of sensations of visible movement, visible form, apparent size, distance, direction, linear extension, superficial extension, solidity, volume, and the like. These, however, are chiefly matters of cognitive experience, of perception rather than sensation, though the latter is by no means absent. Moreover, they are involved with other sensations, all contributory to one intellectual result. Hence we shall not here examine further the questions which are suggested by these terms, leaving them for consideration in connection with the genesis and development of cognitions.

PLEASURE AND PAIN.

§ 58. We have found that sensation comes from contact of the organism and the environment; that from one general sense of motion and resistance and non-resistance, there are differentiated five forms of contact, from which result specialised sensations. These five senses are senses of contact at the periphery of the organism

equally with the general sense of which they are differentiations. So far then as the location of the points of initiation of the sensations we have been considering is concerned the propriety is apparent of classifying them as sensations of the introsusceptive system. But the manner in which they minister to functions of introsusception and repulsion does not appear simply from a classification which takes account only of the localities where the sensations begin. A second classification of sensations is needed, which has indeed been constantly referred to in the process of our exposition, but which has not prominently been brought forward. This is the classification found in Chapter VIII. § 10 of this work, namely into *Pleasurable*, *Painful* and *Indifferent Sensations*.

§ 59. We can only refer to each one's own experience for an explanation of what a pleasurable or a painful sensation is; we can no more define a pleasurable feeling than we can define a feeling. But we can show under what circumstances each one of these forms of experience takes its rise. An indifferent sensation is simply a sensation, a feeling of peripheral contact without any special reference to pleasure or pain, a stimulation or excitement of the sensory apparatus really or apparently neutral as to pleasure and pain. When, however, the effect of this peripheral contact is to increase or conserve vitality, the sensation becomes a pronounced pleasurable one; when, on the other hand, the effect is to depress or destroy vitality the sensation becomes painful. It will be recollected that we defined life (Chap. XIX. § 5) to be the evolution and integration of an organism, and showed that the process of life is a continuous adjustment of inner to outer relations. It appears, therefore, that when the contact of external forces with the organism produces effects which promote evolution and integration, the sensations induced are pleasurable; but when the effects promote dissolution and disintegration the sensations are painful. And since the integrity of the organism depends upon its adjustment to outer relations, the process towards that adjustment is pleasurable, while a mal-adjustment or movement thereto is painful. Pleasurable sensations, then, indicate a movement toward assimilation and adjustment, and painful sensations a movement toward mal-adjustment, disintegration, and dissolution.

§ 60. It is evident from these considerations that whatever contact affects the periphery, whether generally or at the organs of specialised sense, in such a manner as to disintegrate the surface, will cause pain, the sensation being acute or massive accord-

ing to the amount of surface involved. A prick, a cut, a stab, a laceration, a bruise, an abrasion, a rupture, an inflammation,—all these terms express painful sensations. So also anything which disturbs the nominal condition of introsusceptive organs so as to interfere with the natural exercise of their functions is painful. Too great pressure, constraint, strain, over-exercise give pain. But any contact which stimulates and increases the vital energies and favours the natural functions causes pleasure.

§ 61. Movement and exercise of the limbs and members give pleasurable sensations, because such exercise promotes the vital movement of assimilation and integration. The currents of vital forces are impelled forward, the dead matter is pushed out and the new living matter pushed into its place. All of the movements of extension which have been heretofore mentioned are pleasurable to the extent that they accomplish these purposes. But when from too long continued or too intense exertion the vitality is lowered instead of raised, fatigue and pain ensue. Resistance has also the effect of active movement until the strain is so great as to cause fatigue or until the impinging force overcomes the resistance and causes disintegration of the surface. Very many of these sensations of extension and resistance are mental. This indifference may come from a balance of pleasure and pain, or it may come from a minuteness of the effect, enabling us only to distinguish an excitement without being affected by pleasurable or painful quality; or again, there may be a mental quality which is a basic element of sensations out of which pleasure and pain are differentiated. We shall recur to this subject in treating of pleasures and pains in a subsequent part.

§ 62. It is obvious that the quantity of sensation will very materially affect its pleasurable or painful quality. A small amount of either acute or massive pressure may be stimulating and pleasant, while a large amount of the same impinging force may be painful. So also the continuance of operation of the same agency in producing sensation affects greatly the quality. That which for a time is pleasant after a while causes fatigue and pain; on the other hand, as in the case of smells and tastes, the disagreeable frequently passes into the pleasurable, after continuance of the sensation.

§ 63. Touch sensations are pleasurable chiefly as they stimulate muscular action and as they conduce to repose after such action. Soft contact is hence ordinarily pleasurable, and on the score of stimu-

lation so also is friction if it be of a gentle character. Tickling is likewise very frequently pleasurable. Hard contact is pleasant when stimulation is needed; sometimes even hard contact gives repose where soft contact will not. Many would prefer for a couch a board to a feather-bed. Sensations of touch are painful when they create fatigue and when they indicate disintegration of the surface. The former is muscular pain, the latter is primarily dermal. In this view hard contact and acute contact are characteristically painful—always so if the degree or continuance of the impingement is great enough. Stinging is a painful sensation. Roughness is ordinarily so; though sometimes serving the purpose of pleasurable stimulation of thermal sensations, those extremes which depress the vitality and disintegrate the surface are, according to the law of pleasure and pain, of a painful character. When, however, the effect of either heat or cold is to stimulate and promote the increase of vitality, sensations are pleasurable. The terms *warmth* and *coolness* express the pleasurable elements of both heat and cold, while *burning* and *freezing* express the painful. The pleasures and pains of temperature are chiefly organic and unlocated, though excited by nerves having their termini at the periphery, whether a special set of nerves or the nerves of touch we do not know with certainty.

§ 64. Sensations of smell are governed by the same law we have been considering. The surface affected by odours is very small as compared with that affected by objects of touch, but to the extent of that surface any stimulation to action is pleasant if not carried to the point of fatigue, and any disintegration of the tissues gives pain. But the quality of the sensations depends chiefly upon associations with the respiratory and digestive organs (§ 30). Those odours which create organic feelings of freshness are pleasurable; so likewise those whose effect is appetising. But those which give rise to organic feelings of suffocation and of nausea are painful. Even where the organic feelings do not seem to be aroused with the sensations of smell, it is probable that they actually are incipiently excited, and that the pleasurable or painful quality of those sensations is derived from the initiatory stage of an organic feeling.

§ 65. Taste sensations are in the same category with those of smell. Apart from the tactile effects upon the tongue and mouth, substances brought into contact with the organs of taste arouse pleasurable or painful sensations largely as they produce organic

feelings of relish or disgust. The sensations of taste are but the beginnings of alimentary organic sensations, pleasurable as they promote evolution and integration, and painful as they have a tendency to induce disintegration and dissolution. Taste sensations, however, are not infallible guides as to what is ultimately pleasurable or painful. Many things are sweet to the taste but bitter to the belly, and bitter to the taste but agreeable to the assimilative system. This arises from the fact of the effect of impinging substances depending upon a variety of circumstances both of the internal and external environment. The intensity of the impact of force, its continuance, the amount of surface affected, all have their bearings on the ultimate sensations excited. A substance may be sweet to the taste, stimulating to the tissues in the first instance, but after continuance and increase of force may begin to cause disintegration. A poison agreeable to the taste, if held in the mouth, would doubtless generally disintegrate the surfaces of the mouth after a time, and the pleasurable taste would be succeeded by a pain in the same manner as an organic pain follows its introduction into the stomach. A sweet taste, as long as it continues, is itself evidence of commencing assimilation and adjustment of inner to outer relations; but that this process of adjustment will continue cannot certainly be inferred from the existence of the pleasurable sensation; we must have the benefit of other experiences before we can determine. Hence agreeable taste (and the same thing is true of smell) cannot be absolutely depended upon to indicate what should be introduced into the system to preserve its integrity and increase its vitality. But this does not militate at all, as will now be seen, against the general doctrine that a pleasurable sensation is an evidence of increased vitality, and a painful one of depression and disintegration. And it is still generally true, subject to the limitations we have just adverted to, that taste (with smell) is, according to its pleasurable or painful quality, a valuable means of settling questions of introsusception and repulsion, or rejection of particular substances as they are brought in contact with the organism.

§ 66. It has already been remarked that auditory sensations and those of sight for the most part derive their quality of agreeableness or painfulness from associations and representations. They are pre-eminently ministers to the intellectual functions. The pleasurable and painful qualities of sounds we have already set forth in describing sweet and harsh sounds (§ 45). The

pleasurable effects of musical sounds are obtained from a complexity of associations which we shall consider later. So also the pleasure and pain of articulate sounds are derived from associations. But apart from associations there is a primitive pleasure and pain coming from sounds, the nature of which is not understood. We know that sweet harmonious sounds produce pleasurable sensation and harsh discordant sounds painful sensation, but why they do is not evident. I am disposed to believe that sound bears to the nervous centres a special and direct relationship affecting the nervous substance there and its functions more generally and more quickly than the ordinary contacts of which the lower senses inform us. Thus when those motions which give pleasant sounds are brought into contact with the nerves of hearing they are quickly and readily diffused through the cerebral centres, and have a tonic effect increasing the vitality and tending to preserve the integrity of the nerve structure; while on the contrary those motions which give painful sounds are propagated along the nerves and through the centres, and there cause deterioration and disintegration of the structure with depression of the functional activities. The nerves of hearing present a vast number of separate points of contact very near the cerebral centres, and thus is rendered possible a very delicate sensibility to the most minute variations of quantity, quality and combination. What particular motions and combinations tend to conserve the vitality of the central nervous substance and why they do so we are not able to say, but possibly the degree of resistance the molecules of the structure are able to afford to each other when motion is excited may determine the question. As moderate exercise of the muscles increases the vital force and over-exercise diminishes it, so a moderate amount of auditory motion may stimulate the nerve functions and tend to conserve or renew the structure, while a greater amount may have the reverse effect. Probability is lent to this supposition from the fact that the pleasure of sound largely depends upon variations of impression. We speedily tire of one strain, and alternation and variety are necessary to a continuance of the pleasurable effect. Moveover, loud sounds are more apt to be painful than fainter tones, and we cannot bear them as long. Acute sounds, with their rapid vibrations, cannot be endured as long as graver sounds. Again, sweet sounds are harmonies—concords, indicating an assimilation, which is propagated to the brain and is wrought in the nerve structure; while harsh sounds

are discordant and indicate a mal-adjustment, which, communicated in motion through the nerves to the centres, creates repulsion and mal-adjustment there, and consequent depression of vitality.

§ 67. The stimulating quality of light constitutes the foundation of the pleasurable sensations which arise from it, aside from associations; and, like the sensations of hearing, those of sight have a very important, direct and special action upon the cerebral centres. The intrinsic pleasurable or painful quality is not, however, so marked as in the case of many other sensations. Alternations of light and shade contribute largely to pleasurable effects; too great intensity and monotony produce painful results. In themselves the pleasurable and painful sensations of light, colour, and lustre can be traced to the above mentioned conditions. The effects of light vibrations are much more subtle than those of sound (§ 55, 56).

§ 68. It should be observed with reference to sight and hearing, as well as of the lower senses, that when the stimulus is so strong as to produce disintegration of the sense organs their special sensibility is lost in the general organic feeling of pain. And further, diseased conditions of those organs produce various feelings of pain, not differing in kind from those which arise from diseased conditions of the organism in any of its members and quite distinct from painful sensations arising from external impacts in the normal exercise of the special sense functions.

§ 69. Although the differences in modes of presentativity of objects external to the organism seem to depend upon differences of structure and function of peripheral nerve organs, yet in reality these differences are ultimately dependent upon modes of central action. Sensation does not arise in the nerves, but at the centres. If the nerve-fibres connecting terminal organs with the brain be severed between the two, no degree of stimulation of the former will produce sensation. On the other hand, if the terminal organs are removed the brain action will often reproduce sensations previously experienced. Visual sensations occur after the eyeball is removed; and tactual sensations located by the mind in the periphery frequently arise after the limb in which they are located has been amputated. For every sensation there must be cooperation of nerve centres, and differences in these central organs primarily give rise to differences in the sensations themselves. The nerves and peripheral organs of the different senses are so

constituted as to be susceptible to the peculiar mode of motion which they convey to the brain; but the centres where they end must be so constituted as to be able sensibly to receive this motion and arouse that peculiar mode of sensation. After they have been so affected as to produce their special mode of sensation, it does not require a repetition of stimulus from the periphery to reproduce it. Excitement from other parts of the brain will set its activities in motion and develop a representation of that sensation. Probably any excitant whatever which could cause the production of a sensation would produce in that region only that particular mode of sensation. The localisation of the sensations themselves in different parts of the body, wherever the exciting cause is present, is a matter which will receive consideration a little later.

§ 70. In the brain probably the most, and perhaps all, of the centres of sensation are located in the cerebral hemispheres; there the nerves of sense terminate. But in the present state of knowledge we are not able to assign more definite location to these centres. Interesting researches, however, are in progress which may result in giving us a scientific topography of the brain. I do not regard these investigations as sufficiently complete or conclusive to warrant anything more than a reference of them to the student who is desirous of doing something still left undone in the department of psychology.[1]

3. SENSATIONS OF THE ASSIMILATIVE SYSTEM.

§ 71. Except so far as the special senses of smell and taste are concerned with the assimilative system, the sensations of the latter are general, organic or systemic, and indefinite. They blend with unlocated sensations. Their definite localisation is indeed impossible, but by a course of association and experiment, as we come to have a knowledge of the anatomy and physiology of the human body, we can in a general way determine the localities where the exciting causes of particular sensations are at work.

§ 72. The intellectual characters of these sensations are very few. They are to be measured almost wholly by pleasurable and painful quality in various degrees. Assimilation proceeding freely

[1] See Bastian's *Brain as the Organ of Mind* (and works therein cited), Chap. XXIV ff.

and normally in the organism generates a mass of organic pleasurable sensation which is the foundation of our agreeable consciousness; while assimilation impeded, interrupted or prevented, thus hindering or stopping evolution and integration, and favouring disintegration and dissolution, generates a mass of painful sensation which is in like manner the basis of our feelings of pain. In the ratio that assimilation is promoted pleasure ensues; and in the degree that it is prevented pain arises. We will notice a few groups of assimilative sensations.

§ 73. *Relishes and Disgusts.*—These sensations, the one class pleasurable the other painful, we have already considered under sensations of taste (§ 36). Disgust, when carried to its farthest extent, passes into nausea or stomach-sickness, a pronounced massive feeling of pain.

Hunger and Thirst.—These are the most powerful and most prominent sensations of the assimilative system. They appear as massive distressing feelings, affecting the whole system, and stimulating to great efforts for relief. Accompanying hunger are often painful contractions of the stomach. As the feelings of hunger and thirst continue without any appeasing they pass into the general and unlocated sensations of inanition.

Repletion.—Opposed to the pains of hunger and thirst are the pleasurable sensations of repletion. These are massive and pervasive, creating a general feeling of comfort and enjoyment. In another part of this work we shall find occasion for detailing the pleasures and pains connected with and growing out of these various sensations, together with all their associations. Over-repletion causes *satiety*, a feeling of pain.

Indigestion.—Whenever the course of digestion is interfered with and its natural action impeded, sensations of uneasiness and distress arise in varying degrees of intensity. The feelings are massive in general, though sometimes passing into acute pain. Nausea is frequently an outcome of indigestion, and this may end in retching and vomiting, a peculiar, painful experience.

Lesions.—Whenever, by defect in the assimilative apparatus or by the presence of disintegrating substances, lesions occur in the organs of assimilation, all the painful sensations of disease make their appearance. There is a massive sensation of pain mingled with acute pains now and then, more or less continuously, dreadful heat, thirst, prostration, inability to move, unrest, perhaps chills, and a general aggregation of all the pains of human

experience, varying in their combinations and degrees according to circumstances. These pains depart either on restoration to health or as death supervenes.

Respiration and Suffocation.—The action of respiration has an important bearing on assimilation, as we saw in Part III. of this work. The sensations of free and unhindered breathing of good air are extremely pleasurable, as we also noted in our exposition of sensations of smell (§ 30). The sensations are massive, and have an effect to stimulate, revivify and refresh. They blend readily with other sensations of the assimilative and other systems. Opposed to these the feelings of suffocation are correspondingly depressing. They are illustrated in the breathing of bad air, in holding one's breath voluntarily for a little time, in certain forms of disease like asthma, and in drowning. The sensation of complete suffocation is insupportable, and if not relieved speedily is followed by death.

§ 74. The general difference between sensations of the assimilative and introsusceptive systems will have suggested itself. The former are relatively massive, fused, undifferentiated, giving volume of undistinguished feelings, while the latter are more acute, minutely distinguishable, multiformly differentiated and highly integrated, giving sharp differences and great variety of feelings. The introsusceptive sensations are the tentacles by which the mass of conscious life within communicates with and adjusts itself to the external medium ; the assimilative sensations are those of the progress of the internal life. Naturally, then, the introsusceptive sensations are the sensations of intellect, and the assimilative those of feeling in general.

§ 75. The nerves through which sensations of the assimilative system arise in the brain proceed to the cerebro-spinal axis from all parts of the body. The impressions for the most part pass through the medulla and lower parts of the brain to some portion of the cerebral cortex, but to what portion is at present unknown. It is probable that a great deal of organic or systemic pleasure and pain is produced indirectly from the nourished or depraved condition of the central nerve structure itself.

§ 76. It should further be observed that whereas sensations of the introsusceptive system in large part arise from impinging force or from contact with unassimilated substances (I except such feelings as the organic sensations of fatigue); on the other hand in the sensations of the assimilative system there is an equal

number, and perhaps a preponderance, of sensations arising from a contact wherein there is exercised a divellent force with its corresponding resistance. In hunger, for instance, nutrition is stopped, assimilation no longer takes place, and evolution tends to cease. Correspondingly the forces of dissolution and disintegration begin their work. The first step is disassimilation, and unless the waste is supplied dissolution proceeds rapidly. The beginning of this pulling apart of the organism, with the resistance offered by its cohesive and evolutive forces, is the explanation of the general feeling of pain in feelings like hunger where sensation arises not from contact with an external substance but from the want of it. As the particles of the organism return to the environment, before the contact is destroyed sensation arises, but of repulsion and not of attraction, of *pull* and not of *push*, of dissolution and disintegration, not of evolution and integration.

4. SENSATIONS OF THE EXPULSIVE SYSTEM.

§ 77. Disassimilation succeeded by assimilation, matter pushed out by new substance moving to replace it does not hinder, but is an essential promoter of evolution and integration.

And where matter is disassimilated, the expulsion of that matter from the organism is in furtherance of vitality. Hence we find that sensations which come from the exhalatory and excretory organs and processes in the exercise of their normal functions unimpeded are generally pleasurable, while the hindrance and obstruction of those functions cause pain.

§ 78. The sensations of the expulsive system are divisible into four groups, which we will enumerate :—

Relief.—The characteristic pleasurable sensations of excretion and exhalation are of relief. We have got rid of something weighing us down and impeding vital movements. This effect, in connection with respiration, has already been noticed; it is equally noticeable in perspiration, in micturition and in defæcation.

Oppression.—The opposite condition induces feelings of oppression; like the former, organic and massive, and growing more painful as the oppression continues. Suffocation is entitled to a place here, as well as under the preceding head.

Lesions.—When the oppression continues so long or is so frequent as to induce disease of the organs, or when those organs are brought to such a condition from any other cause, then sensations

of pain arise which do not differ in kind from other sensations arising from the lesion of organs, though we may locate them in the expulsive system.

Tactile Sensations.—The necessity of expelled matter passing through the periphery causes various tactile sensations to arise in connection with expulsive processes. The sensations of the skin occasioned by perspiration and its attendant processes, the motion of air through the nose and mouth in respiration, the sensibility of the sphincter muscles, and the sensations of motion in other avenues of excretion, make up this class of feelings.

§ 79. The intellectual value of sensations of the expulsive system is very small. Discriminations of locality are made, but they contribute only to intellectual life by promoting those general organic conditions of feeling which are requisite for the play of thought.

5. SENSATIONS OF THE REPRODUCTIVE SYSTEM.

§ 80. The sensations we have been considering hitherto bear reference primarily to the evolution and integration or the dissolution and disintegration of the individual. There remains quite a unique class of sensations which accompany processes having regard chiefly to race-evolution. These are the sensations of the reproductive system, in which the activities of growth are extended to the production of new individuals.

§ 81. Sensations of the reproductive system may be separated into two groups, namely *Organic Sensations* and *Modified Tactile Sensations*. The organic sensations are similar to those of repletion when the sexual functions are exercised, and of hunger when their exercise is denied, together with sensations of oppression like those resulting from the pressure of excretory needs. There is a deep, massive, organic feeling of relish and satisfaction, together with relief and general stimulation which comes in connection with and after an act of sexual association. The opposed feelings to which reference has just been made arise when the reproductive organs become filled with their secretions and restraint is put upon their exercise.

§ 82. In addition, the act of reproductive contact of the organs of the two sexes is accompanied by some of the most powerful sensations of pleasure of which we have experience. These sensations are intense, pervasive and engrossing. They are aroused by the friction of extremely sensitive surfaces of the generative

organs upon each other. There is also probably a chemical action of commingled lubricating fluids secreted by the two sets of organs respectively. A high degree of heat is also involved. The peculiar sensations excited by the sexual contact have led some thinkers to regard the sensibility as a special sense. This view has not been adopted generally, and the best opinion seems to consider the genesic sense to be a modified tactual sensibility combined with organic pleasurable feelings. The general orgasm with which the sexual act terminates is a synthesis of these tactual and the organic sensations. Tactual contact of the other parts of the body also increases the general pleasurable effect.

§ 83. Abuse of the reproductive organs produces various organic sensations of lassitude, fatigue and general depression of all the energies. Diseases of those organs develop the same pains in kind as disintegration of the structure in other parts of the body.

§ 84. The normal sensations of the reproductive system arise at least in their completeness only during the reproductive period of life. Before this period begins the sensations capable of being excited in these organs are comparatively faint, and after it is over, as old age comes on, the sensibility loses its acuteness, the tactual element remaining after the systemic has passed away.

In the female there is a variety of sensations, mostly organic and painful, produced by the carrying of the embryo. After parturition there are sensations of lactation which may be classed with pleasurable excretion. The pains of parturition and of the reproductive organs thereafter are organic pains, often acute and very distressing.

§ 85. The influence of the reproductive system upon both intellectual and emotional life is very great. It is, however, through emotional action that intellectual associations arise. The fundamental character of the sensations is their quality, as pleasure and pain, not their intellectual discriminations.

§ 86. The act of reproduction is only an act of extended growth and assimilation, the evolution and integration of the individual passing into the evolution and integration of the race through the assimilation of two individual germs, and the inauguration therein of a new course of evolution. This view of reproduction is in harmony with the general doctrine of pleasure and pain, and explains the apparent contradiction arising from the circumstance that in many cases in the animal kingdom reproduction is speedily

followed by the death of the individual, a presumable pleasurable experience not only failing to increase vitality but exhausting life altogether. Pleasure is an accompaniment of increased vitality either in the individual or in the evolution of new individuals. Pleasure favours evolution and integration, though only up to a certain point the evolution and integration of the individual; the continuance of the race and its development being an end in the operation of natural forces, which conscious action is forced to promote.

§ 87. It is legitimate to infer that the lower animals have in greater or less degree the sensations of assimilation and the opposite, of excretion and of reproduction, of which we have now taken cognisance.

CENTRALLY-INITIATED FEELINGS.

§ 88. There is no absolute distinction between centrally-initiated and peripherally-initiated feelings. We have seen that no feeling arises without the co-operation of the nerve-centres; we have also seen that irritation of afferent nerves within the body produces feeling, as well as the irritation of afferent nerves at the outer periphery. Hence it is difficult to determine exactly where centrally-initiated feelings may fairly be said to begin as in contradistinction to peripherally initiated. Still there is a general distinction, usually expressed loosely by the terms *sensation* and *emotion*.

§ 89. In Part II. Chap. VIII. of this work we divided the centrally-initiated feelings into Original and Reproduced, the latter including Reproduced Peripheral and Reproduced Central feelings. These groups likewise can only be broadly distinguished. Feelings are so interblended that we are quite unable to draw definite lines of separation. The prevailing character of a given state of feeling is all we can hope to mark scientifically. It may even be questioned whether there are any centrally-initiated feelings at all beyond possibly the reproduced peripheral. Nevertheless I think we are warranted, at least provisionally, in making the divisions given above.

§ 90. The genesis of centrally-initiated feelings is simple, though the feelings themselves as they exist are highly complex. When, for instance, an afferent current, epi-peripherally-initiated, reaches a centre it arouses a resistance; it may then be reflected entirely and return as a motor current directly to the periphery,

in which case there is reflex action either without or with consciousness. The latter results from a delay or hindrance to the passage of the current which arises at the centres. If the conscious action affects only the centres to which the afferent movement proceeds proximately, then the feeling is a sensation. But when the nerve-centres affected radiate the motion received throughout the central nervous mass, meeting everywhere new resistances which become the centres of new radiations, and these in their turn exciting others, thus creating multitudes of motions and counter-motions in the central substance and often resulting in an outpouring of efferent motions in many directions instead of one—the feeling arising under these circumstances is an emotion, a complex of feeling which may be said to be, relatively speaking, centrally-initiated. Further, when in the course of central nervous action, interaction and reaction, feelings are excited which are recognised as revived feelings of previous peripheral experiences, we have a class of remembered or represented sensations, faint copies of former vivid feelings; this representation occurring without the presence of the original stimulus from the external world, which developed the feeling in the first instance. Centrally-initiated feeling may also arise in connection with automatic action of the centres, unstimulated by peripheral contact, the centres emitting nervous motion which interacts with the motions from other centres and produces the general disturbance which characterises an emotion or the varied series of representations which constitute trains of thought.

§ 91. In whichever way they are excited, centrally-initiated feelings are distinguishable into the groups above mentioned. The points of their initiation in the central system, and the causes of the movements which occur in connection with them, we cannot indicate, because we have no map of the central nervous system, and no means of making one, which will show in any detail the paths of nervous movements. Accordingly we have no opportunity to classify central feelings, as we did peripheral, by the different special localities of their initiation. We can, however, make subdivisions on the basis of the different ways in which these feelings express themselves in outward movements, and in case of the reproduced sensations in the same way in which we subdivided the original sensations. But in treating of the genesis of these centrally-initiated feelings it is evident that we shall not be detained so long as we were with the class of peripherally-initiated,

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§ 92. I have alluded to the possible question as to the existence of any proper centrally-initiated feeling. A word or two here on this point will not be out of place. Where the contact of some force external to the organism excites afferent motion in a nerve either epi-peripheral or ento-peripheral, the resultant feeling, though obtained only through the co-operation of centres, is termed peripherally initiated. Now when the nervous disturbance at the centre which is caused by the afferent current propagates itself to other centres and along the inter-central passages, various conscious effects arise. The feelings excited are not sensations, but are either reproduced sensations, faint repetitions of vivid feelings, or are emotions. In either case we regard them, according to our classification, as centrally-initiated feelings. But to be exact, they were initiated at the periphery, and are only consequences a little more remote of peripheral stimulus. Let us take the other case. When the nervous centres are fully charged through abundant and superabundant nutrition, an automatic motion goes forth from these centres along efferent nerves to various localities of the periphery. If it be the fact that efferent nervous motions are not accompanied with feeling, the feeling which arises upon these automatic discharges is an agglomeration of ento-peripheral with epi-peripheral feelings, in a word, of sensations. Our emotions are made conscious by the expression of them in the organism. Therefore here again the feeling is peripherally initiated. And these two cases cover all the modes of nervous action, for the centres act only by reflexion or automatically.

§ 93. But we have not told quite the whole story. Automatic movements from the centres may terminate, as we saw in a preceding chapter (Chap. XXIV. § 3), at the outer periphery, the inner periphery, or in the central system itself. It is quite possible for the radiation of motion from centres to expend itself within the central system without directly passing to the periphery, and in the course of such radiation through the cen-

tral system to give rise to reproduced sensations and to emotions which are truly centrally initiated. Moreover, as we have often observed, no sensation at all takes place without central action and in all probability some central radiation. And, finally, there is relatively a central genesis and a peripheral genesis, the one arising from central interactions and the other from peripheral action, which may be properly enough made the foundation for divisions which consciousness recognises, though it may not be able clearly to define their limits.

§ 94. It appears, however, that centrally-initiated feelings are in no wise different in kind from peripherally-initiated, and from the close relationship we have noted it also appears that the latter readily pass into the former. Also that reproduced central, reproduced peripheral, and original centrally-initiated feelings blend with each other to make a general mass of central feeling whose elements we cannot accurately determine.

§ 95. Historically, sensation, either epi-peripheral or ento-peripheral, precedes and is a pre-requisite to centrally-initiated feeling. There must first have been sensation before there is reproduced sensation. And there must have been the stimulus of sensation before emotion arises. There may be automatic action before sensation, but it is the movements which that action arouses in the periphery which give rise to feeling as they are reported by the afferent nerves. But once having had sensations, central automatic action will again excite and reproduce them, modifying them also in many ways, as we shall see in the next Part. If, however, we had never had any sensations we never could have had any emotions.

§ 96. Having had sensations, it appears to me that we may have reproduced sensations purely through central action, without the existence of any presentative stimulus, except so far as the reproduced sensation has its own presentative side. We may have trains and groups of reproduced sensations without connection with any present sensation which is generated outside of the central system.

§ 97. But with emotions the case is somewhat different. An emotion involves ordinarily, perhaps invariably, present actual sensation from afferent nervous currents at the outer or in the inner periphery. In truth, the emotion is found to be made up of many sensations fused and blended, and the emotional state varies as the sensational stimuli vary. Indeed, we distinguish an emotion from

owing to the fact that in the former case we have to deal with feelings which, for the purposes of description, we are obliged to locate, as regards their initiation, in only one place, and which are confined to two modes as regards the manner of their inception. Besides, not very much can be done to give a full account of the feelings we are now considering till after we have examined into the sources of cognition and volition and ascertained the laws of their development.

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a sensation largely by the greater quantity of feeling excited. The emotion, it is true, may be aroused by central stimuli; reflection, as well as sensation, gives rise to the most powerful emotions; but the feeling itself is usually a mass of sensations. As the central system is excited motor currents diffuse themselves all over the body, and excite actions of the muscles, the blood-vessels, the respiratory organs, and the organs of secretion and digestion, which are reported to the centres again by afferent currents and there give rise to a volume of feeling which constitutes an emotion. Mingled with this are a great variety of volitional movements of reproduced sensations and cognitions, changing the body of feeling and themselves changed by the alterations in the emotional state.

§ 98. It will be apparent that we now have occasion to make use of the third classification of feelings which we noted in Chapter VIII. (§ 11), namely the division into Presentative and Representative. Sensations are presentative feelings; so also are original centrally-initiated feelings, so far forth as they are original. Reproduced central and reproduced peripheral feelings are representative. Emotions have a mixed presentative and representative character, being presentative so far as they include present vivid feeling and representative to a high degree in their reproductions of past feelings with their accompanying cognitions. Of course reproduced feelings of any kind are actual present feelings, and so far are presentative; but they differ from presentative feelings as such by the fact that they are consciously represented (Chap. IX. § 12). Hence they also have a presentative and a representative side.

§ 99. From what has gone before it will appear that any classification of feelings is of little use which attempts to mark out two mutually exclusive classes of feelings under the heads of sensations and emotions. The relation of sensations to emotions is that of special distinguishable feelings easily located and cognised to a general undistinguishable mass or volume of feeling. I do not see how an unlocated sensation can be distinguished from an emotional state; but when we begin to localise it we assign it to a given portion of the periphery and thus remove it from the sphere of emotions. The effect however, as feeling, is in no wise different in the two cases. We are able, subject to the limitations before noted, to assign a central or peripheral initiation to feelings; we can distinguish the peripherally-initiated quite minutely by

localising this initiation at different points of the periphery; but when we pass into the more subjective field, peripherally-produced and centrally-produced effects are so intermingled and blended as to make the resultant states, states of *feeling*, rather than states of sensation or states of emotion. What are ordinarily termed classifications of the *emotions* should properly be called classifications of *states of feeling*.

§ 100. The quality of centrally-initiated feelings as pleasurable, painful, or neutral or indifferent, follows the course of development of these feelings in the same way, and subject to the same laws, as in the case of peripherally-initiated feelings. Whatever feelings occur in the course of evolution and integration are pleasurable; whatever arise in the process of disintegration and dissolution are painful.

§ 101. The quantity of feeling varies greatly according to circumstances, and differences in that respect create differences in centrally-initiated feelings *inter sese*. As regards quantity, feelings differ in degrees of acuteness or intensity, mass or volume, and continuance, according to the force, the persistence, or the multitude of the stimuli.

The quantitative estimate of feelings never has been successfully accomplished. There is no numerical standard of measurement, and adjectives—as great, small, medium—if used, indicate the amount of feeling in a manner as vague as unscientific. The difficulties interfering with quantitative estimates are very considerable. The most insuperable obstacle is the fact that even if a scale were adopted by any person to express degrees of feeling, there would be no way of applying the same standard to another person, much less to a great number of persons. So far from the expressions of feeling being alike in different individuals, they are not uniform in the same individual; and on expression we must rely for our knowledge of the consciousness of others than ourselves. So far however as we may, each for himself, approximately judge of quantity, the following indicia may be employed:

1. We may directly compare one feeling with another preceding or succeeding it, and determine roughly by introspection which is the stronger. We cannot, however, discriminate sharply in this way.

2. We can estimate a pleasure by the amount of pain it quenches, and the converse. Despair may be replaced by joyful elation, so that the latter completely obliterates the former. Dis-

gust may be overcome by pleasurable feeling. Enjoyment, when at its full tide, may suddenly be destroyed by some great grief.

3. The continuance of a state of feeling may also be a measure of its intensity, and with it the length of time that there remains the power of recovering or representing the state. The measurement of time, of course, can be effected by objective means.

4. The frequency of recurrence of states of feeling is also a measure of intensity. The frequency of angry moods, of despondent fits, of outbreaks of merriment, of the gratification of any desire, bears witness to the hold the feeling has upon the mind.

5. The engrossing of our thoughts and acts by a given feeling is also an index of its quantity. The effect upon present action, the occupation of the mind, the resultant influence upon conduct, all are aids in quantitative determination. This relates partly to the expression of feeling in outward movement.

6. The energy of a given action often measures the quantity of feeling. The sharper the pain the more vigorous the effort to get rid of it. This concerns the expression of feeling likewise.

7. The degree of physical vigour is important oftentimes in determining the quantity of feeling. It influences feeling so much that a feeling which would otherwise occur may be prevented entirely by a changed state of physical vitality, and by similar variations in the vital energies feelings arise which would not have arisen under other circumstances.

In judging of the feelings of others we are obliged to learn the modes of expressing feeling both as regards strong feeling and weak. We must take account in each instance also of the constitution, physical condition, and circumstances of the individual. We must also consider what efforts are made for concealment and what facts are hidden by circumstances. Such observations, taken in connection with reliable testimony, will give us the data for approximate quantitative estimates of feeling.[1]

§ 102. We must not omit to notice the effect of quantity of feeling, whether intensive, extensive or protensive, upon pleasure and pain. The exercise of the nervous functions involves some degree of disintegration and waste. Long continuance of excitement, too great intensity of stimulus, too large an area affected—either one or all together will inevitably depress the vitality and disintegrate the nerve structure. There must be repose to secure a renewal of vitality. Hence monotony of excitement becomes painful, and

[1] Cf. Bain, *Emotion and Will*, Chap. I.

novelty is pleasurable. Strong feeling, both intense and voluminous, exhausts and indeed cannot be maintained for a long period. Hence the powerful feeling of pleasure rapidly degenerates if prolonged into feelings first of satiety, then of fatigue, then of positive pain.

§ 103. We can now understand the very complex nature of centrally-initiated feelings. Their intellectual and volitional connections and influences are very many and very strong. Taken as masses of feeling, involving sensations as well, the full treatment of these mental phenomena requires an examination to be made in several directions and an exposition of a number of particulars. These are indicated in the following scheme, which, with a few changes, is that of Professor Bain.[1]

For the treatment of all feelings there is required consideration of their—

Physical Side.

- Bodily origin.
- Bodily diffusion, expression or embodiment.

Mental Side.

- Characters as Feeling.
  - Quality: Pleasure, Pain, Indifference.
  - Modes of Presentativity.
  - Quantity:
    - Intensiveness, or acuteness.
    - Extensiveness, or volume.
    - Protensiveness, or continuance.
- Volitional characters.
  - Mode of influencing the will.
- Intellectual characters.
  - Susceptibility to discrimination and agreement, Representation and Succession.

§ 104. Diffusion and radiation from nervous centres begin with the beginning of consciousness, and this diffusion and radiation is accompanied with feeling. Representation also we have seen to be a fundamental element of states of consciousness. Hence centrally-initiated feelings of some sort are present from the beginning of conscious life.

[1] *Senses and the Intellect*, Chap. I.

CHAPTER XXVII.

THE GENESIS OF COGNITIONS.

§ 1. 'As the knowing I have an idea is merely having the idea; as the having a sensation and knowing I have a sensation; the knowing, for example, that I have the pain of the toothache and having that pain; are not two things but one and the same thing, so the having a change of sensation and knowing I have it, are not two things but one and the same thing.' Thus argued James Mill,[1] and thus expressed the identity of experience of feeling and cognition. A cognition is not the same thing in scientific classification as a feeling, but the experience of a cognition is the same as the experience of a feeling. There is one experience of which cognition and feeling are two aspects. Hence when a feeling is generated there is also generated a knowledge of that feeling.

§ 2. The genesis of cognition, then, both as to time and manner is coincident with the genesis of feeling. The same causes which produce the one produce the other. There may be vast differences in development, but none in the genesis. When feeling is born, cognition is born.

§ 3. In Chapter XXV. (§ 5) I quoted from Herbert Spencer his view of the probable genesis of states of consciousness up to the point of the inauguration of perceptions in their earlier stages. In this place I will resume the quotation at the point where we left it, and continue it a little to show this distinguished philosopher's conclusion as to the genesis of cognitions beyond the simpler perceptions. I make this quotation, indorsing in the main the opinions there expressed, and as introductory to some further remarks of my own.

§ 4. 'Between a perception physiologically considered and a perception psychologically considered, the relation now becomes manifest. We see that a perception can have in a nerve-centre no definite localisation, but only a diffused localisation. No one excited fibre or cell produces consciousness of an external object; the consciousness of such external object implies excitement of a

[1] *Analysis of the Human Mind*, Chap. XIV. Sec 2

plexus of fibres and cells. And not only does this plexus of fibres and cells differ with every different object, but it differs with every different position of the same object. A clear understanding of this may be conveyed by an illustration.

'A good piano has, including semi-tones, between eighty and ninety notes—say, for convenience of calculation, a hundred, to which last number, indeed, a pedal piano reaches nearly, if not quite. Such a piano, then, if its keys are struck singly, is capable of yielding but a hundred different tones. If its keys be struck two together, the different combinations that are possible amount to 4,950; if three together, to 161,700; if four together, to 3,921,225; if five together, to 75,287,520. These numbers, increasing thus with enormous rapidity as the complexity of the chords increases (until we reach chords of fifty notes, after which they begin to diminish), yield when added up a total requiring a row of 30 figures to express it—a million, million, million, million, millions. Each combination is, considered as a set of sonorous vibrations, unlike every other; and though the majority of them are but inconspicuously different, yet there are millions of millions of them that differ in well-marked ways. So that out of this comparatively simple structure a practically unlimited number of functional effects is producible. If, now, instead of the keys of the piano, we suppose a cluster of such sensitive bodies as those which form the retina; if instead of the appliances which convey to the strings the impacts given to the keys, we take the fibres that carry to the optic centres the impressions made on these retinal elements; and if instead of strings made to vibrate we put ganglion corpuscles excited by the impulses they receive; we shall see that a perception may be compared to a musical chord. As by striking a certain set of keys there is brought out a particular combination of tones, simple or complex, concordant or discordant; so when a special object seen strikes by its image a special cluster of retinal elements, and through them sends waves to the fibres and cells of a corresponding central plexus, there results the special aggregate of feelings constituting perception of the object. Without further detail the reader will see how it thus becomes possible for a limited number of fibres and cells to become the seat of a relatively unlimited number of perceptions.

'While it thus in a general way illustrates perception under one of its aspects, the action of a piano fails wholly to illustrate it under another of its aspects; as the motion of a dead mechanism

must necessarily fail to represent in full the functions of a living one. For, as above pointed out, a perception is formed only when a cluster of real feelings excites a correlated cluster of ideal feelings. If our piano were so constituted that after any two chords had been repeatedly sounded in succession there resulted some structural change such that when the first of these chords was again evoked by a performer's hand a faint echo of the second chord followed without aid from the performer's hands, the parallel would be nearer. We should then have something analogous to what happens when a nervous plexus, excited by certain properties of an object, diffuses its excitement to another plexus that has on previous occasions been excited by other properties of the object. And here, indeed, while we are giving the rein to imagination, let us take a wider license—let us suppose that several chords struck in succession thus aroused faint repetitions of the many following chords forming the rest of the music to which they belonged, we shall then be helped to conceive more nearly how the elements of perceptions become linked together. And on contemplating the infinity of musical effects obtained by combining different compound chords in ever-varying successions, we shall get some idea of the infinity of perceptions that arise by the organising of clusters of co-existing feelings in endlessly changing sequences—we may now pass from perceptions to *ideas* properly so called. Though every true perception along with its presentative feelings necessarily contains certain representative feelings, these do not at first become what we usually understand by ideas. They have not the detachableness which distinguishes ideas that are fully developed. They can be called into existence only by the sense-impressions with which they are directly connected in experience; and they can continue to exist only so long as these continue to exist. To return to our illustration—a creature so constructed as to be capable of nothing beyond the compound co-ordinations just described, resembles a piano that is silent until touched by the hands of the performer. Its nervous system is played upon by external objects, the clustered proportions of which draw out answering chords of feelings followed by faintly-reverberating chords of further feelings; but it is otherwise passive—it cannot evolve a consciousness that is independent of the immediate environment.

'How does such independent consciousness become possible?

When do ideas rightly so-called arise? They arise when compound co-ordination passes into doubly compound co-ordination. They grow distinct in proportion as the correspondence extends in space and time. They acquire a separateness from direct impressions as fast as there increase those series of clustered sensations which unite the visual sensations received from objects out of reach with the tactual sensations afterwards yielded by such objects. They are the necessary concomitants of that process by which, through intercalated physical states, there is established a moderate relation between psychical states that cannot be brought into immediate relation. And they have for their seats those intercalated plexuses which co-ordinate the co-ordinating plexuses previously existing. That is to say, ideas form a larger and larger portion of consciousness as fast as there develop those two great pedunculated nerve-centres which distinguish animals; ideas become more multitudinous and more separable from direct sense-impressions as these centres increase in size and structure; and eventually, when these centres are highly evolved, ideas admit of combination into trains of thought that are quite independent of present external perceptions.'[1]

§ 5. Without following Mr. Spencer in his extension of the illustration of the musical instrument, we can readily see the line of his thought and find his propositions harmonise with our general knowledge of the genesis of cognitions, and to a very considerable degree express that knowledge. Let me ask the reader to follow my own course of thought a little in further development of this subject.

§ 6. We can attain a correct idea, in my judgment, of the relations of cognition to feeling by regarding the latter as general, homogeneous and indefinite consciousness, and the former as specialised, differentiated and definite consciousness. As a state of consciousness is indefinite, it is a state of feeling; as it becomes specialised and definite, it is cognition. Were we able to take any nervous current of excitation and isolate it, confining and thus defining it, our experience would be that of cognition; were we to let this same current be diffused through the central system and blended with other excitations, the experience would be one of feeling. As a matter of fact, we do not get isolated definite conscious experiences, but so far forth as they are definite they

[1] *Principles of Psychology*, Part V Chap. VI

are cognition, and so far forth as they are indefinite they are feeling.

§ 7. The beginnings of consciousness both in the individual and in the race are characterised by a preponderance of feeling over cognition, and the consciousness resulting is undeniably a more diffused and indefinite consciousness. As cognitive powers grow, the consciousness becomes more specialised and more definite, and with this an increase in heterogeneity is observed. Concomitantly with this increase in these directions the conscious life becomes more intellectual, and less controlled by feeling. As intelligence waxes the predominance of feeling decreases.

§ 8. Though we are not able yet to locate definitely in the brain the centres of the various mental operations on their physical side, we are able to mark some differences in brain structure corresponding to differences of mental function. No one of these differences is more prominent and more certain than that as to the development in complexity and usually in size of the cerebral hemispheres corresponding to the growth of intelligence. This confirms the belief that cognition is a differentiation from feeling, and that the apparatus for cognitive experience is superimposed in the order of evolution upon a structure capable only of giving rise to feeling with a minimum of cognition.[1] This view has given rise to an assumed division of the nerve-centres into Sensori-motor, relating to the operations of sensation, and Ideo-motor, relating to the accompaniments of cognitive experiences. On this hypothesis excitation of the inferior or sensori-motor centres produces the indefinite consciousness we call sensational feeling, which as long as it remains in the sensori-motor region is experienced as feeling, and excites motor currents proceeding directly from that region. But when the excitation radiates beyond and excites the ideo-motor region, the nerve motions become separated and isolated and run in distinct channels instead of being generally diffused, and there arises the definite consciousness we call cognition, not unattended with feeling, but, a portion of the nervous force being as it were drawn off, leaving less feeling below in proportion as there is more force concentrated in cognition above. Moreover, the ideo-motor region has its own indefinite motions excited, creating feeling accompanying cognition. It has also reactions upon the sensori-motor regions below, arousing their activity in fainter or stronger degree

[1] See Maudsley's *Physiology of Mind*, Chap. II

according to circumstances. It has also its direct connections for motor action. To use Mr. Spencer's illustration, the activities of the superior region play upon and excite all those of the lower region.

§ 9. Corroboration of this hypothesis is found in the fact that our cognitions multiply and our cognitive experience subordinates our feeling consciousness in the general ratio of the increase of minuteness, separateness, and delicacy of nerve conduits. The possibilities of cognitive experience in the way of variety and predominance increase as there increase facilities for a multitude of separate and distinct sensations. Where the papillæ of touch are most numerous, as for instance at the finger ends, the discriminative power of the skin is at its highest. The superiority of the higher senses of hearing and sight from an intellectual point of view is attended with a most marvellous susceptibility to vast multitudes of separate, minute, delicate impressions. This is seen to the highest degree in the case of sight, and there we found the intellectual characters of the experience almost to exclude those of feeling. On the other hand, the lowest intellectual consciousness arises where the organic feelings occur, the latter impressing consciousness in the most indefinite manner of all sensibilities; and these feelings are generated through the least differentiated nerve-structures.

§ 10. The antagonism between cognition and feeling is another proof, and this opposition is an undisputed and perfectly plain fact of mental life. Where feeling is strongly aroused the cognitive faculties do not perform their work freely and thought is diminished, but when the feeling subsides cognition again becomes regnant. And when the state of consciousness is predominantly an intellectual one, the feelings are at low ebb. All this means that as the nervous excitement becomes diffused and general throughout the central system, there is no opportunity for isolated and differentiated movements to take place; while, on the contrary, if the nervous force passes into the region of these isolated differentiated channels and expends itself through these channels, there is less force to diffuse below.

§ 11. Again, the effect of minuteness of quantity in sensational impact furnishes still further corroboration. If a small surface is excited, or if the intensity of pressure upon a larger surface is small, or if the continuance is short, the experience is (generally speaking, of course) discriminative, that is cognitive. This is different from

that; this is a novel sensation—is the character of the experience. But let the quantity of force increase in any of the particulars mentioned and pleasure or pain comes and absorbs consciousness, while the cognitive aspects of the experience sink into comparative or even total insignificance. This statement, it will perhaps be thought, ought to except the case of some sensitive surfaces; but those very surfaces on examination support the rule, for their sensitiveness only results in an ability to be affected by a smaller amount of force, and there it is equally true that a minute impact yields cognitive experience, while a stronger degree of force initiates feeling.

§ 12. It is hard to distinguish indifferent feelings from cognition. It may be suspected that a great many of the so-called indifferent feelings really are pleasurable feelings of a low grade of intensity. But if we could find an absolutely indifferent feeling, I should not expect to discover anything else but a cognition. What we ordinarily characterise as indifferent feelings are the faint diffused excitations which attend cognitive experience, and which are not sufficient in quantity to have a pronounced effect either in raising or lowering vitality.

§ 13. If the above exposition of the genesis of cognitions is correct, it in no wise interferes with the truth of the statements made at the beginning of the chapter, and elsewhere, that there is no feeling without cognition, and that every state of consciousness postulates both feeling and cognition. We have seen that there is no sensation without some sort of contact, and the beginning of a feeling of contact involves discrimination, that is cognition. We first see, cognise, or recognise; then we feel. And, however strong the feeling may become, we still cognise agreements, differences, representations, durations and successions, something impinging and something resisting, until all consciousness is blotted out. So also when we have cognition we have more or less feeling, pleasurable, painful or indifferent, which belongs to and is a part of the experience.

§ 14. The most prominent and important division of cognitions is into Presentative and Representative. The passage of a current of nervous excitation along a given channel modifies the structure in such manner as to create a proneness to repetition of the excitation in the selfsame channel. The original excitation is relatively vivid, and the reproduction relatively faint. Moreover, the reproduced excitation may occur through a different stimulus from

the original one. If that original stimulus were peripheral, for instance, it does not require the same peripheral impact to reproduce the excitation. It may be aroused by another peripheral, or by some central stimulation. But the effect produced is a renewal in fainter degree of the original conscious experience. Inasmuch as there are countless lines and channels of nervous movement through the cerebral hemispheres and in the ideo-motor regions, innumerable impressions being all the time received and each generating its own reactions, creating a vast complexity of interfering and blending movements, there is going on continually a re-excitation of nerve centres and their communications, thus developing all the variety of our ideal life. The laws under which this development proceeds will shortly occupy our attention; so we need not dwell upon them in this place.

§ 15. This re-excitation, which constitutes representative cognition, involves a repetition in faint degree also of the diffused excitation, whatever it may have been, which accompanied the presentative experience. Hence, attending representative cognitions there are representative feelings. We thus have explained the reproduction of sensations. The genesis of emotions also is better understood. For the diffusion of excitation may pervade the ideo-motor region very extensively, accompanying the movements of thought; it may and usually does extend into the sensori-motor region, and in proportion as it becomes general the cognitive movements abate. But the complex character of emotional phenomena is readily appreciated from the condition of the nerve-centres and their commissures arising from a fecundity of representation embracing cognitive movements, accompanied by all the diffused motions which those cognitive movements carry along with them, subject also to every manner of central reaction to which particular circumstances give rise. Accordingly we find that, though in a particular instance the existence of an emotional state is antagonistic to cognitive activity, and the converse, yet the development of emotional capacity runs parallel with the development of the cognitive faculties. The higher the intellectual development, the greater the capacity for both quantity and variety of emotional life. This naturally must occur, for the greater the ability to experience representative cognitions to a high degree of complexity, the greater the ability to form combinations in great variety of the feelings which attend such cognitions. The more capacity is developed for ideo-motor consciousness, the

greater opportunity both for a high degree of cognitive and of emotional development. The control of emotions, as we shall presently see, is increased with progressive development, but is not by diminution of the capacity for emotion.

§ 16. In our general analysis of states of consciousness (Chap. IX.) we discovered representation to be an essential part of conscious experience. This was illustrated, among other ways, by the fact that continuance or duration was not to be conceived as possible without a consciousness of representation. Duration postulates sameness of the experience, and sameness is not cognisable without a representation from moment to moment of past experiences. The physiological process, giving in the nervous system the counterpart of such a mental experience, is probably this:—We have noted that the chief difference between presentative and representative consciousness is that the former is relatively vivid and the latter relatively faint. Now when an excitation of the nerve structure occurs it comes as a wave. It has its rise, culmination, and subsidence. The greatest vividness of experience is where the greatest amount of force is in active exercise. This point moves along, leaving behind the nerve molecules still in motion—vibration, if you please,—but with a subsiding motion; while the greatest degree of motion is beyond. Thus the experience is of vivid or presentative experience, indicated by the top of the wave of nervous vibration, while beside it and with it goes along a fainter or representative experience indicated by subsiding nervous vibration. Every cognitive experience, therefore, has its presentative and representative side; the same is true of experiences of feeling, which are apprehended and measured by cognition.

§ 17. The course of evolution necessitates a progressive integration as the result of the same forces which work out differentiation with its complexity and heterogeneity. This law applies to the development of states of consciousness also. Such integration in conscious states is accomplished with an increase of definiteness. There is a coagulation and consolidation of states of feeling into states of cognition, and of cognitions with and into each other. Cognitions are associated, aggregated, integrated, and the most highly evolved cognition is the most highly integrated cognition. The progress of this integration is reducible to laws, which it will shortly be our province to examine.

§ 18. The coalition, concurrence and consolidation of conscious experiences into those definite experiences which we style cognitions,

as it progresses necessitates the reduction of these experiences from comparative simultaneity to succession. From a diffused indefinite consciousness of simultaneous impressions, there is evolved a definite consciousness of serial impressions. As cognitions appear they range themselves in serial order, for only thus can they become isolated and definite; while the experience of feeling is of many blended impressions occurring simultaneously. This seriality is not perfect or complete, since the present, vivid, definite consciousness is never absolutely engrossing; there is fainter consciousness and more diffused consciousness in different grades of diffusion; so that between the state of feeling and the most vivid cognition there are intermediate states of more or less definite consciousness which appear in experience as cognitions subordinate to the principally engrossing cognition of the given moment. Nevertheless, as definiteness increases and integration progresses, the tendency is obviously toward a succession of experiences as making up conscious life.

§ 19. I do not hesitate to extend to the lowest forms of animal life the statement that wherever there is consciousness there are both feeling and cognition. It does not seem to me to be possible for feeling to exist without knowledge. For the reasons before stated, the cognition at the beginning is a less prominent aspect of the experience than the feeling, but some cognition is and must be present. There must be a discrimination in order to feel. There is a minimum of cognition but still some cognition. Hence there is no such thing as sentience without consciousness. We cannot feel without being conscious that we feel. Mental life, therefore, so far as it is sentient is also conscious life, though it may be dependent upon and regulated by processes that are not conscious, and though there may be different degrees or grades of consciousness, from the simplest, most heterogeneous, and most indefinite to the most complex, most heterogeneous, and most definite.

§ 20. I have now said all that is required to be said respecting the genesis of cognitions. Much more, it is true, might be remarked respecting the genesis of particular cognitions and particular classes of cognitions, but that is matter relating to the development of cognitions, and can only appropriately be considered after we have reviewed the factors of that development.

CHAPTER XXVIII.

THE GENESIS OF VOLITIONS.

§ 1. INTROSPECTIVE examination reveals volition as a distinct, indecomposable phenomenon of conscious experience, just as distinct and ultimate as either cognition or feeling. Its connection with the two, however, is so close that it appears as a third aspect of states of consciousness, feeling and cognition being the other two. It is for us now to inquire under what circumstances and conditions this remaining aspect of states of consciousness is generated.

§ 2. Volition we described to be a determination to action (Chap. VIII. § 13), a putting forth of energy for an end, but we must refer each one to his own experience for adequate knowledge on the subject. Obviously volition relates more particularly than either feeling or cognition to the subjective *power* element in conscious experience. Volition has reference more largely to the activity of the mind directed outward upon environing things. It is the phase of conscious states immediately preceding action.

§ 3. We have already seen that a nervous current excited in the periphery will travel along different nerves to a nerve-centre or cluster of centres, and thence be reflected through some resisting force at the centre along efferent nerves to a peripheral termination and there produce contraction, that is to say, action; and all this without consciousness (Chap. XXIII.). We have also seen that the nerve-centres will, from their own exuberant nervous energy, discharge themselves of force, and excite without any peripheral stimulus currents along efferent nerves to the periphery and there generate motions in other parts of the organism —and this also without consciousness (Chap. XXIV.). We also learned that consciousness arises in the degree that the translation of afferent motion into efferent is hindered at the centres and made less direct and continuous (Chap. XXV.).

§ 4. A more special examination revealed the fact that conscious experience is always some form of an experience of motion and resistance, of action and reaction. A study of feelings

(Chap. XXVI.) confirmed the results of our general analysis (Chap. IX.). Such an experience involves an element of *power* exercised both passively in suffering action from without and actively in outward movement. This consciousness of power resisting and acting is the primitive element of what we are accustomed to term *will*. Here is the dynamic element of volition (Chap. VIII. § 13).

§ 5. Let us endeavour to see what must happen when a state of consciousness is generated. I say *must* happen, for unfortunately we do not know what actually *does* happen, since in order to see, we should have to destroy consciousness, to say nothing of the need of more powerful microscopes than human invention has yet supplied us with. We do know that we have a nervous system, and that stimulation of afferent nerves will send through a centre a current which will produce contraction of tissues. We also know that our conscious states correspond with molecular motions of this nervous substance; that some of these motions are attended with consciousness, and some are not. But we do not know what quantity of motion, as to extensiveness, intensiveness or protensiveness, is requisite in order to give rise to consciousness. That it is a matter of quantity seems to be evident, for, so far as our knowledge goes, the conclusion appears warranted that the nervous substance is homogeneous, and that all nervous motion is alike in quality. Thus much premised, what must we infer to be the course of nervous motion when a sensation is generated? Let us take the simplest cases first. A nervous afferent current, on arriving at the centre of sensation, meets with a reaction; then and there is the genesis of sensation. But before reaching the centre there are some things to be noted. We have seen that the periphery is organised for introsusceptive or repulsive purposes; that introsusception is the beginning of assimilation, and where the process of introsusception and assimilation does not take place consecutively, repulsion does take place. When, therefore, contact of some external object with the periphery begins, assimilative introsusception occurs, or else repulsion, in the ordinary course of animal life. In the former case an attractive motion is begun of the molecules of the external object and the molecules of the organism, resulting in the extension of this motion to the nerve molecules, and consequently in the addition of vitality to the nerve structure. Integration takes place, and with the integration an additional force of motion is propagated by that structure to the centre. On

arriving at a centre, the confined motion of that centre is liberated and augments the motion from the afferent nerve; the motion of the centre coalescing with the incoming current, and both together operating to integrate the molecules of the central structure. This coalescence and integration not being organised gives rise to what we call a pleasurable sensation. So long as the integration goes on the pleasure continues and there is no movement outward, the experience occupying the attention and no desire for change arising, the only movement being a drawing in toward the centre. But an increase in integration tends itself to prevent and to absorb motion, thus eventually bringing to an end those very movements upon which consciousness depends; so that a reverse movement of disintegration is inaugurated, and with this reverse movement the experience changes from pleasurable to painful. The centrifugal motion thus excited may combine with motion newly liberated from other centres, and form the course of a new integration, or it may pass outward again toward the periphery. Now let us return to this periphery for a new departure, and suppose the second of the alternative cases we had to choose from a moment ago; let us suppose that repulsion takes place between the organism and the external object; the motion then propagated along the afferent nerve is a motion of disintegration, molecules pushing away from each other. On arriving at a centre the force liberated then augments, in like manner as before, the movement of disintegration. A sensation of pain is the result. Motion is first radiated outward to the periphery to resist and repel the baneful contact, but if the cause continues to operate very soon all movement whatever abates, there being a constant dissipation of force and no renewal. If, however, the efferent motion repels or avoids the harmful object, the disintegrating movement ceases, the nervous structure begins to re-integrate, and a feeling of pleasurable relief arises. Once more let us consider initiation of nervous movement, but this time from the centre. Centres surcharged with force will discharge themselves in all directions, and thus generate movement at the periphery through efferent nerves. This movement, if it conduces to evolution and integration, will be returned through afferent nerves to the central system as pleasurable sensation; if, on the contrary, it tends toward the reverse result it will be returned as painful sensation. To sum up what we are taught by these propositions: Contact of an external object is followed either by introsusceptive-assimilative motion or repulsive motion,

the one drawing the external substance inward, the other pushing it outward. The former movement is propagated to the nerves in the same form of attractive motion of the molecules of the nerve to each other. The latter is likewise extended to the nerves in the same form of repulsive motion of the particles from each other. In the former case there is at each stage first, a diminution of motion resulting from integration of the structure; then from those integrations a renewal of motion from the accumulation of force in the integrated molecules, this renewed motion being at first greater and then lessening as a new integration is accomplished. In the latter case there is at each stage first, an acceleration of motion, since a minimum of force is retained; and as the motion proceeds the molecules of the structure draw away from each other, all the while thus sending forward more motion at the expense of the structure. The secondary effect, then, is to abate motion altogether, since there is no renewing movement to replace the force drawn off. At the centre the introsusceptive-assimilative motion encounters a new supply of force in connection with interaction of which with the afferent force pleasurable sensation is generated. So long as renewed integration goes on pleasure continues. When the repulsive motion reaches the centre the liberated central force adds itself to the afferent force and creates a divellent, centrifugal movement in all directions. This motion tends speedily to exhaust itself, inasmuch as it drains the centres of force. Pain first stimulates action, then quenches it. On the other hand, as we have seen just now, pleasure first abates movement, detaining, as we say, the attention; then it develops an increased and strengthened action. Integration is always followed by differentiation, and differentiation may either be succeeded by new integration or it may pass into dissolution.

§ 6. We have now learned that a pleasurable sensation abates movement and then generates a reinforced movement; and that a painful sensation first increases movement and then abates all action. We have also seen why this must be so: it is simply an example of the law of evolution, which is itself deducible from the law of the persistence of force. But much more is to be observed. Our exposition has proceeded as if there were a single afferent nerve-current proceeding to a single centre. Such simplicity is purely imaginary, supposed for our convenience in understanding. All sensation involves a multitude of afferent impressions in all degrees of concentration and isolation. Nor is

there any such central simplicity as has been supposed; this has been made sufficiently clear hitherto in the present work. We have now to see what follows from this complexity. It is quite certain that consciousness depends upon some considerable degree of diffusion of nervous motion in the central system. Feeling we concluded to be indefinite, homogeneous and undifferentiated consciousness. We have just observed that pleasurable consciousness indicates integration. When, therefore, we have a pleasurable feeling-consciousness of the sensori-motor region, it tends to pass into the higher consciousness of the ideo-motor centres, that is, it tends to become thought-consciousness, the quantity of motion being first diminished but the structure being at the same time strengthened to furnish a new supply of motion.

§ 7. Pleasurable consciousness then satisfies action, that is, prevents outward motion, but from the nature of the process by which it is produced, it cannot continue long in any one state. The assimilation and integration which give it being must be followed by differentiation or by disintegration. The first flush of pleasurable experience is the strongest. The motion then rapidly diminishes until uneasiness is produced. This uneasiness is the initiation of pain, and with it there is a quickening of motion; hence results change of state: a new supply of central force starts a new integration; but this new integration is farther removed from the original stimulus, and gives that fainter variety of consciousness we characterise as representative.

§ 8. We must not lose sight of the fact, so often recalled to mind in these pages, that upon the return of a given nervous tract to quiescence after excitation, it does not exist in the same state as before. There is a modification of structure which creates less resistance to a repetition of the stimulation. A greater sensitiveness to similar impressions is generated. Representations then occur, in some degree at least, increasingly according to the amount of repetition. Every representation makes another more likely to occur.

§ 9. We have now before us the causes (leaving out the questions of connection of body and mind) of action and abatement of action; also the causes of change and continuance of states of consciousness. We are thus better prepared to comprehend volition. Let us consider first sensori-motor consciousness. When a feeling of pain arises, there is a general movement outward along the efferent nerves to the periphery. In its lowest form this

movement is apparently purposeless: the effect, however, may be either to remove the organism itself away from contact with the object, or to project the object away from the periphery. If such a result does not occur, the organism is overwhelmed, motion is stopped, and life is finally crushed out. If it does occur, however, in either of the two ways just mentioned, a sensation of relief arises; the drain on the vital resources is stopped, and the course of evolution and integration is rendered free again. The movements which effected this relief followed a feeling of pain, and were of the class we usually denominate involuntary. These movements produced a certain pleasurable sensation. In consciousness, then, there was first a state of pain, then a state of pleasure, the one passing into the other without distinct separation. If now the sensation of pain which originally gave rise to such movements be repeated, the movements will recur and the pleasurable experience will follow, other conditions being the same. This is necessary in the uniformity of nature. But why, when the feeling of pain is thus repeated, are not *all* the original radiated movements repeated? Why are the movements which gave relief before selected in place of the others? The answer to this question will determine the genesis of the selective element in volition.

§ 10. Let us suppose the contact to be an irritating object pressing upon an isolated part of the organism. Pain arises, and movement radiating in all directions. Movements remote from the point of pressure accomplish nothing in the way of relief. They are centrifugal movements, and their tendency is to abate the movement, tending to scatter energy in all directions, and with it to destroy nervous force, and disable the nervous structure from transmitting nervous motion, thus creating a greater resistance to nervous motion. On the other hand, let the movement occur at the point of contact with the cause of pain, which removes the organism from the influence of this cause. Force passes from the organism into the object, depleting the efferent nerves in the progress; but this is immediately followed by an increment of force by way of the re-integrating afferent movement which gives the sensation of relief. The supply of efferent force, however, failing before complete relief is afforded, pain is again generated which creates another burst of efferent motion. This follows the line of least resistance, which is the course from which efferent motion has been drawn in the prior movement; this is again followed by

relief: and so on around this circuit till the cause of pain is wholly removed. The augmentation of the discharge increases the disintegration of the structure, cuts a deeper channel as it were, and on re-integration there is left a structure offering less resistance to future movements in the same direction. Hence a sensation of pain followed by sensation of movements giving relief from that pain, if it recurs, will send its concomitant efferent motion into the channels in which previously motion wrought out the relief movements. It must be borne in mind that the motion along the efferent nerves, terminating in muscle or other tissue and not in nerve-centres, is not attended with any consciousness of that motion; it is the afferent current, terminating in the centre, which gives the sensations.

§ 11. Let us now pass to the ideo-motor relations. The process of differentiation and integration which develops thought out of feeling has already been considered in the last chapter. A part of the diffused motion accompanying sensation passes into the ideo-motor regions. Instead of an indefinite sensation, we have a definite sensation, or a perception. If the sensation is assimilative and thus pleasurable, the perception is detained in consciousness; there is no movement to avoid it. If it be disintegrative, or if it becomes so and thus painful, it rapidly flies out of consciousness of its own motion unless prevented. The course of motion is no other than that which occurred from the lower centres, and is governed by the same laws. When successful movements (for avoiding the cause of pain) are made, there is presented in the ideo-motor region, through associations the nature of which subsequently will be explained, a definite consciousness of those movements with heightened and pleasurable feeling. This state of consciousness passes away and is succeeded by others, but it has left in the structure a modification which creates a susceptibility to recurrence. If this particular tract of the structure is subsequently excited by any nerve stimulus whatever, irrespective of the original sensational excitation, the original state of consciousness is repeated in fainter degree together with its motor excitations.

§ 12. We have now seen how motion of the organism arises and abates in connection with states of consciousness, giving rise and fall of movements. We have also seen under what conditions both presentative and representative states give rise to selected movements. All of these movements, however, are of the class

usually denominated involuntary. We have conscious involuntary movement in general, radiated from centres; and we have also conscious movements involuntarily selected—motion involuntarily directed into certain channels. We have now a basis for volition, we have volitional movement, but we have not yet the genesis of complete volitions. Let us see what we must further take into account.

§ 13. We must take into account the interference of nervous currents. If there were only one circuit of nervous motion, such as we have been contemplating, there would be no conscious choice. This arises only from the conflict of nervous movements, or from the inhibition of action toward which nerve-movements tend. Suppose a painful pressure at the end of a limb. There are represented certain movements which have previously brought relief; with this representation is also a representation in fainter degree of the pleasure accompanying those movements. The motor current goes outward, along the channels of previous motor currents, for similar relief. But suppose the movement of the limb away from the painful contact is prevented by some force holding it down, disconnected from the original cause of pain. The cause of pain persists; the painful feeling persists; the idea of the movements necessary for relief persists; but relief does not come. Instead, there is added to the experience a new pain, that of prevented movement—pressure of the muscles outward resisted, overcome, inhibited. The complex experience, then, is of a sensation of pain from the original cause, then a representation of certain movements with a pleasurable feeling (of relief) represented also, then a sensation of those movements attempted and inhibited. These experiences occur in close succession, and constitute the complex experience we call *Desire*—inhibited movement, the completion of which is represented as pleasurable. In other words, we have inhibited movement toward an End. And this is evidently a higher stage of volition.

§ 14. But yet this is not all of volition. The case just supposed is a case of will without power to realise. Our complete volitional experiences are of will with power to realise. The only difference, however, is in the latter case a transfer of the inhibition from the periphery to the centre. The knowledge that there is no external hindrance, but by change of mental state specific results can be obtained, creates the sense of what used to be considered 'freedom of the will.' When a representation of a given move-

ment or set of movements occurs, through association there is a tendency to represent other movements or sets of movement; or perhaps some external stimulus may operate to introduce into consciousness a new state. The motor currents, which otherwise would have passed into channels of action allied with the first state, are subjected to a modification coming from the new force attendant upon the new state. If the motor currents of the second state are antagonistic to those of the first, there will be an inhibition of the first proportional to the strength of the second. If the two are nearly balanced, the two states will alternate till one or the other receives an augmentation of force sufficient to overcome. If the first state is stronger, the inhibition by the second is only partial, or momentary; if the second state carries with it a stronger force, it quenches and supersedes the first. When the idea of certain actions attended with pleasure gains possession of consciousness by the concentration of force, and secures a persistence over the ideas of other actions which suggest themselves, then volition is exercised and a definite determination to action ensues.

§ 15. We have now attained all the essential elements of a complete volition. Whatever else we have to learn belongs rather to development than genesis. We see that the central and most important idea involved in the general notion of volitional choice is that of self opposing self. We are conscious of one set of motives emanating from the Ego as states of feeling, and opposed to these another set of motives emanating from the same source —I do not now take into account the ultimate causes of these feelings. A central power balancing opposed motives, and finally giving the preponderance to one set over the other, is the consciousness we describe as volitional.

§ 16. The result of our examination thus far confirms the implications and assertions heretofore made as to the existence of a self-active power of the Ego acting and reacting upon the Non-Ego. On analysing the phenomena of conscious volitional experience we find at the bottom a central spontaneity acting and reacting upon inward moving forces. As a part of every conscious experience there is consciousness of an Ego which acts and suffers. In every sensation there is consciousness of an I who *feel*; in every thought an I who *think*. The dynamic or power element of volition then is a part of every conscious experience. Volition

is thus held to be an additional aspect of consciousness beyond feeling and cognition.

§ 17. But that the dynamic element does not complete volition has already been shown. And the relation which selection or choice bears to states of consciousness is not so obvious. That it must make its appearance very early in consciousness is apparent from the fact that desire arises with the beginnings of conscious life. Alternations of pain and pleasure are the earliest experiences of human beings, and the links of connection between pleasures and certain actions and pains and certain others are soon forged. We shall find, however, on closer investigation that the genesis of selection is earlier and more inevitable in connection with consciousness than at first we might suppose. This discovery we shall make upon turning our attention to the phenomena of representation. Let us keep in mind the fact that conscious representation is representation of cognition and feeling together. And if representation is but a process of assimilation and dis-assimilation, integration and differentiation, there must be continually going on a course of selection voluntary or involuntary. The voluntary character of this process depends upon representation and the complexity of representations; for there is no choice without an end of that choice; and ends are represented pleasurable experiences. As representative consciousness, therefore, becomes more complex there is greater opportunity for the interference of the motor impulses connected with those states of representation, and hence greater opportunity for conscious choice. But we found that representation is an essential factor in all consciousness; and we know that the earliest consciousness is of a multitude of separate impressions. Hence there is no appreciable period of consciousness when voluntary selection is absent, though its range may sometimes be very limited.

§ 18. It will be well to restate in series the elements of the different experiences of action with which a conscious being has to deal; this will be a summary of what we have brought out by our course of thought in this and some of the preceding chapters. Introductory to conscious experiences we should note—

First: Reflex Action without consciousness.—Here of course we have only nervous action and no subjective experience whatever. The same is true of—

Second: Automatic Action without consciousness; and—

Third: Mixed Reflex and Automatic Action without consciousness.

Fourth: Conscious Reflex Action.—In these cases we have (1) Sensations of the effect of the action without sensation of the stimulus, as in various organic motions. These embrace the sensations of ento-peripheral action, which are scarcely separable from automatic actions. (2) Sensations of impact or external stimulus followed by sensations of reaction in the muscles or other parts of the periphery. This group embraces the characteristic conscious reflexes, as swallowing, winking on the impact of light, sneezing, vomiting, and sphincter action generally.

Fifth: Conscious Original Automatic Action.—Here we have in the first instance sensations of outward movement followed by sensations of reactions from the environment on the outgoing force. (1) Ento-peripheral action, as that of the beat of the heart, the pulsations of the blood, the excitations of the reproductive organs. (2) Epi-peripheral action, as the spontaneous movements of the limbs, the motions in breathing (partly reflex and partly automatic), the play of the features, involuntary cries, and the like. In all these cases the mixture of the reflex and automatic is noticeable, and the one class passes into the other without conscious discrimination. (3) Central action, as attention to an experience.

Sixth: Representative Action; Conscious and Involuntary.—This class includes representation itself and its processes of association; and also proper ideo-motor action unimpeded.

Seventh: Representative Action, more or less inhibited at the periphery; Conscious and Voluntary.—In this division we have the development of desires. First, there is a feeling of uneasiness or greater pain; then a representation of movements effecting relief; then a cognition of those movements only partly accomplished, begun but prevented; then a representation of the completed movements. This representation of the completed movements affording relief with the consciousness of present inhibition constitutes a state of desire, in which certain represented movements are chosen and preferred over certain present movements and adjustments.

Eighth: Representative Action, more or less inhibited at the Centre; Conscious and Voluntary. Here we have the full development of choice. Succeeding a feeling of uneasiness attendant upon some cognition, there is a represented pleasurable state;

before this passes into action another representative pleasurable state arises whose motor currents are inhibitory of the former. The former may be reinforced and replace the latter, and the latter in turn similarly replace the former. There hence occurs an alternation between the two until one or the other prevails; and as the resistance of the one gives way and the power of the other augments, there arises the experience which is expressed in the phrase, *I will.*

To these classes we will add three others, embracing actions whose development will be explained in the succeeding two parts, but which should be brought to mind now in order that we may understand the relations of involuntary and voluntary actions.

Ninth: Acquired Reflex Actions; Conscious and Involuntary.—By education, through repetition chiefly, certain stimuli can be made to excite certain movements inevitably and without hesitation. We are conscious of the stimuli and the resultant actions, but have no power to arrest the latter after a certain degree of stimulation is reached.

Tenth: Acquired Automatic Conscious Involuntary Actions. —This class takes in the products of mental action which have become formed by associations becoming indissoluble. Acquired Reflexes and Acquired Automatic Actions together make up those actions which are frequently termed *Automatic* in the sense of being machine-like in their certainty and regularity.

Eleventh: Acquired Unconscious Actions.—Beyond the foregoing there are automatic actions, and possibly reflex, which are acquired in a conscious being, but which are below consciousness or which take place in the temporary interruption of consciousness, as in sleep. Of course these processes of unconscious cerebration are only known by their motor effects; but from modifications of our mental states which we cannot trace to the action of conscious processes we are often made aware of a sub-conscious power which is exerting its influence in some manner upon the development of states of consciousness.

§ 19. I regard it as extremely unfortunate that the term *volition* has come to refer so predominantly to choice and selection. The foundation fact in the experience is the putting forth of power, and conscious choice is only the highest development of that process. Volition exhibits the self-activity of the Ego, and this may be, relatively speaking, either resisted or unresisted. The latter is almost universally described as involuntary. I have followed and

shall follow the usual methods of designation, because I deem it hopeless to effect a reform, and because, unless the reform were generally accepted, much confusion would result from any attempt to introduce new terms or materially alter the meaning of the old ones. But at least I must express my regret at the existing situation. I shall continue to include, however, under the name *volition*, the dynamic element which effectuates all Ego action; and regard *involuntary* action as being still *volitional*. As we have seen, selection there always is in volition, but this selection may be either involuntary or voluntary, the latter term covering choice between opposed ends.

§ 20. Further considerations as to the different phases of volitional experiences we will postpone to subsequent pages.

CHAPTER XXIX.

GENERAL SUMMARY.

§ 1. In concluding this part of our work, we will recapitulate some of the leading results of our study:—

First. States of Consciousness arise in connection with some degree of complexity in the central system of the nerve-structure. The brain in vertebrates is the index of capacity for consciousness. In the absence of the brain proper, as in invertebrates and some of the lowest vertebrates, an equivalent is found in cerebral or cerebroidal ganglia which are centres of the development of consciousness. But in proportion to the evolution of more complex centres, consciousness of a higher degree arises. Consciousness increases in complexity, definiteness and heterogeneity as the brain becomes more complex and, broadly speaking, as it increases in size, particularly of the cerebrum.

§ 2. *Second.* Some degree of consciousness exists very low down in the scale of animal life. We do not know where consciousness begins, but the indications are that it reaches almost to the lowest limits of animal existence.

§ 3. *Third.* When once consciousness is developed in the species its genesis in the individual occurs at or immediately after birth. This statement applies definitely to man and, proceeding downward, to lower species of vertebrates, then with increasingly

less certainty into the invertebrate kingdom, till we reach species respecting whose conscious life we have almost no knowledge.

§ 4. *Fourth.* Nervous action occurs without consciousness, and is then either Reflex, Automatic, or Mixed. In reflex action the nervous motion begins at the periphery through some stimulus there applied, and thence proceeds to a centre and is reflected again to the periphery. In automatic action the movement begins at the centre and proceeds outward toward the periphery. Very complex movements may be made through unconscious nervous action.

§ 5. *Fifth.* In conscious experience the same nervous agencies are at work, and they operate in the modes which have just been described. Consciousness arises as the nervous movements are less prompt, certain, and direct, and are more impeded, slow and diffused at the centres.

§ 6. *Sixth.* All conscious experience is an experience of some form of motion and resistance, and consciousness exists in all degrees, growing always from the most simple, indefinite and homogeneous to the most complex, definite and heterogeneous.

§ 7. *Seventh.* Consciousness is always the same in kind, differing only in degree, and it always has three aspects, Feeling, Cognition, and Volition, all of which belong to every state of consciousness, though there is usually a preponderance of one over the other in a given state sufficient to characterise the state accordingly.

§ 8. *Eighth.* Feeling-Consciousness, called also Sensori-Motor Consciousness when limited to the effects of sensational stimuli, is the primitive form of consciousness. In this experience cognition is at its minimum.

§ 9. *Ninth.* The beginnings of feeling are peripherally-initiated feelings, either arising in connection with movements of the organism outward upon the environment, or movements of the environment upon the organism. Central movement outward probably marks the first sensations; these, however, are closely connected with or followed by movements of the environment upon the organism or by resistances afforded by the environment. Peripherally-initiated feelings, commonly called sensations, are divided into groups, according to the points of their nervous origination; as sensations of the introsusceptive and repulsive system, the assimilative, the expulsive and the reproductive, and also some unlocated sensations relating generally to the organic

life. The first of these groups embraces the most of the Epi-peripheral feelings, and the others the most of the Ento-peripheral.

§ 10. *Tenth.* Sensations of the introsusceptive-repulsive system include sensations of epi-peripheral contact, as of resistance and non-resistance in various differentiations, namely muscular contact, dermal contact or touch, olfactory contact or smell, gustatory contact or taste, auditory contact or hearing, ocular contact or sight. Sensations of the other systems are usually termed organic or systemic.

§ 11. *Eleventh.* Centrally-initiated feelings arise from the capacity of the central nervous system which has experienced sensational excitation to undergo re-excitation from the self-activity of the centres, which re-excitation gives a familiar repetition of the original experience and extends through motor nerves to the peripheral system, also producing sensational reactions. These centrally-initiated feelings are reproduced peripheral feelings and likewise what are usually called emotions and reproductions of them.

§ 12. *Twelfth.* Feelings of all classes differ as to their quality respecting pleasure, pain, or neutrality as to the pair. When the action and reaction which cause sensation subserve or tend to subserve the course of evolution and integration of the organism, the sensation is pleasurable; when they accomplish or tend to accomplish the reverse result, the sensation is painful. Indifferent or neutral sensations are probably those which are so minute in their effect that their quality cannot be distinguished; or they may arise from the neutralisation of one sensation by another. Neutral sensations might be classed with pleasurable, if we make a dichotomy as to quality.

§ 13. *Thirteenth.* Feelings likewise differ as to quantity, in point of intensiveness, or acuteness; extensiveness or volume; and protensiveness or continuance.

§ 14. *Fourteenth.* As consciousness becomes more specialised, differentiated and definite, cognition rises into greater prominence. Cognition appears to be specialised, definite feeling. Those excitations which produce definite effects produce cognition; those which produce diffused effects cause feeling. The most important division of cognitions is into Presentative and Representative. Every cognition has its presentative and representative side, the latter being the result of the diminishing and subsiding motion after the culminating point of the wave of excitation has passed on.

Representative cognition has always a fainter excitation than that of presentative cognition.

§ 15. *Fifteenth.* The definite specialised currents of excitation which are concomitant with cognition are also attended with more or less diffused excitation which constitutes, causes, or is concomitant with attendant feeling. Re-excitation of cognitive currents hence creates more or less excitation of feeling-movements. As distinguished from the feeling region of excitation, which we may call the sensori-motor, we may regard the thought-region as ideo-motor. But we are unable at present to assign any definite locations in the brain to either feeling centres, or thought centres, or their connections, or to say how they are related to each other in position. But we notice a general correspondence between the development of intellectual capacity and the development in complexity and size of the fore-brain.

§ 16. *Sixteenth.* Cognition and feeling vary inversely. When the nervous force in motion is concentrated into the cognitive channels, there is less diffusion and hence less feeling; on the contrary the greater the diffusion, the less opportunity for definite cognitive consciousness. But with increased development of capacity for complex representations, there goes an increased capacity for the representative feelings which they arouse and which accompany them. Therefore as intelligence grows in complexity capacity for a variety of emotions increases, and with the integration of intelligence, integration of the emotions occurs, thus generating higher developments of emotional consciousness.

§ 17. *Seventeenth.* A leading characteristic of cognitive consciousness is its seriality of impressions. This is necessitated by the definiteness of cognitions, whereas in consciousness, which is indefinite, many impressions occurring simultaneously are blended, and the result is feeling. As definiteness increases and integration progresses the tendency is obviously toward a succession of experiences as making up conscious life.

§ 18. *Eighteenth.* With all consciousness is a consciousness of power either passive or suffering, or active. Every feeling and every cognition involves a consciousness of self resisting inward action, or actively moving outward. This consciousness is the foundation of volition.

§ 19. *Nineteenth.* In connection with states of consciousness movements along efferent nerves generate movements of the organism, of which we have sensations through the afferent nerves

communicating with the centres. Whenever a painful sensation is generated either from impact of the environment upon the organism or of the organism on the environment, motion is radiated outward from the centres. If the cause of the pain continues to operate, vitality is lowered and all action tends to abate. If by movement the cause of pain is removed a pleasurable sensation follows. When pleasure is generated outward motion is abated at first and then stimulated to an increase. The outward motion then which pain causes is drawn into those channels in which a relief from pain is effected. A selection of movements thus begins: this selection is volitional, but not what is usually called voluntary; on the contrary, it is involuntary.

§ 20. *Twentieth.* When a pain is repeated, there is represented the set of movements which previously gave relief from pain, accompanied by a represented pleasurable feeling, the fainter repetition of the former vivid feeling. With this represented state is also repeated the initiation of the actual movements themselves which gave the original pleasure. There is a repetition of the motor features of the former state. The present pain operates as a motive to action; the idea of the movements accomplishing a relief gives an *end* of action.

§ 21. *Twenty-first.* When a movement away from pain and toward a represented pleasure as an end begins and is inhibited at the periphery a state of desire arises, which is will without power to realise. When the movement toward an end is inhibited at the centres by other represented pleasures we have the full development of a complete volition, choice between conflicting ends. One set of represented movements consciously prevails over and extinguishes another set with more or less certainty as the will is powerful or weak.

§ 22. *Twenty-second.* Volitional consciousness, then, is the consciousness of the self-activity of the Ego as reacting upon the Non-Ego environment. This self-activity is not always conscious, but so far as it is conscious it is volitional. Volitional action may be subdivided into involuntary and voluntary, the latter including action involving conscious choice and the former all other conscious action.

§ 23. It is obvious that the important question now presented to us is, What determines representative states? To ascertain the laws of the differentiation and integration of mental states is of the first consequence, for without this we have no science of

mind's development, as feeling, intellect or volition; nor of the reactive influence of mind upon matter. We have investigated the genesis of states of consciousness generally in respect to each of the three aspects. The genesis of particular states in their relation to one another is nothing else than the development of states of consciousness, which we are now about to consider.[1]

[1] I may have in some places laid myself open to the charge of inconsistency or uncertainty as to my ideas upon the subject of the connection of mind and body. I have generally spoken of mental states as concomitant with nervous states; but in some places I have employed language indicating or implying a causal connection. In each case I have used words which seemed to me best calculated to make clear to the reader the facts I then wished to bring to his mind, wholly irrespective of any final considerations as to the nature of the connection of mind and body. I must accordingly ask the forbearance of the reader in this respect, till we come to consider that question by itself, when I shall define my positions as best I am able. Till then I do not wish irrevocably to commit myself nor my reader to any positive declarations or hypotheses, though of course my position in the matter must be more or less evident.

PART V.

FACTORS OF THE DEVELOPMENT OF STATES OF CONSCIOUSNESS.

'Further, the doctrine of evolution derives man, in his totality from the interaction of organism and environment through countless ages past. The human understanding, for example . . . . is itself a result of the play between organism and environment through cosmic ranges of time.'—Tyndall, *Belfast Address*.

CHAPTER XXX.

ORGANISED INHERITANCES.

§ 1. THERE must be a structural constitution of some sort in order that consciousness may be developed. This structural constitution may be mental or physical, or both, according to the hypotheses we entertain as to the connection of mind and matter. But at all events the mental development proceeds alongside of the physical, and to some considerable degree, at least, is dependent on the latter. The physical structure is developed from a germ or germs; and the germ has the potentiality of the adult, being contained somehow within it, but subject to modifying influences in the development. From the fertilised ovum, as we have seen in a former part, the individual grows; and each individual is developed after his own kind. We say then that the individual structure is inherited, and that its structural development, determining also in a degree its functional development, has been pre-arranged and organised in former individuals.

§ 2. A very considerable portion of our conscious life is traceable to pre-organised inheritances of one sort and another. In the first place the general bodily structure with its determinations to a variety of functions is inherited. This fixes the general character of the individual's life. The life of the insect is not that of the mollusk; that of the fish is not that of the serpent; that of the eagle is not that of the elephant nor that of the dog; nor is the life of the dog that of the horse. The life of man is not that of the lower mammal; nor is the life of the barbarian that of the enlightened European. There may be points of resemblance between any two, but there are distinguishing characteristics which are propagated and determine individual life. These appear in mental life as appetites, instincts, likes, dislikes, aptitudes or capacities. We hence find among our inheritances affecting states of consciousness certain predispositions to the development of particular feelings, volitions, and cognitions.

These predispositions are organised in the individual structure, and exert a potent influence upon the formation of our states of consciousness.

§ 3. Without attempting to discriminate accurately between mind and body, and without asserting that the following divisions are independent or mutually-exclusive, we may assign organised inheritances to three groups, as follows:

General Physical Inheritances.
General Capacities for Mental Experiences.
Predispositions to Specific Mental Experiences.

These three groups we will consider in their order.

GENERAL PHYSICAL INHERITANCES.

§ 4. Physical inheritances embrace all the influences upon the development of states of consciousness which arise from the general physical constitution transmitted from one individual or a pair of individuals to offsping. The first class of these upon which it is desirable to fix our attention is *Common Characters of Species*. These are transmitted with such regularity and certainty that for a long time it was considered true that each species was a separate and independent creation and that no process in nature ever caused one species to pass by development into another. Although this conclusion is not true, yet the peculiarities of species are preserved without much modification through long lines of individuals, and hence determine very considerably the life of a given individual.

§ 5. Subordinate to the species common peculiarities of race are perpetuated, occasioning similarities and differences of *blood*. The Caucasian is very different from the Mongolian; the African from the American Indian. Distinctive marks of race affecting mental life, also through the physical structure, are transmitted through many generations, and no human being is unaffected by them. Hence a second class of general physical inheritances is the *Common Characters of Race*.

§ 6. In addition, we have to note the *Common Characters of Family*. These are not preserved for as long a time and through as extended a succession as the two former. Family characters are of such a nature that they can be more readily modified and even eradicated than can race or species peculiarities. Never-

theless they are sufficiently persistent to make them a very appreciable factor in the individual life.

§ 7. A further set of likenesses is preserved and described under the term *Temperament.* Peculiar arrangements of the structure and functions of the muscular, vascular, digestive, nervous and other sets of organs will secure permanent traits in human character. A strong propensity to quick, ardent, and impetuous feelings, to mirth, gaiety, and hopefulness, we distinguish as a temperament and call it *sanguine.* A predominating tendency to an equable or sluggish life, leading to quiet and regular habits, self-control and balance of all the faculties we characterise as a *phlegmatic* temperament; and so on in varying divisions according to different authors. We must observe, then, *Common Characters of Temperament.*

§ 8. There are also *Common National Characters*, which are formed by long continued social connections creating and moulding and transmitting a national life. These are often the same to a partial extent, at least, as race and family characters.[1]

§ 9. Again, there are *Common Characters of Sex*, which are perpetuated through generations. There are differences between the masculine and feminine mind, which no education can alter, and which continues as permanent characteristics of sex. Some mental states are peculiar to men and some to women. These sex peculiarities have a very important influence upon the whole life of the individual, more important than any peculiarities we have mentioned, save those of species.

§ 10. Inherited *Health* and *Morbidity* have a most powerful effect upon individual development. The strongest survive longest, and reach the highest development; the weakest are the soonest to perish, and have the most contracted development. It must be remembered, however, in qualification of the above statement that a high degree of intelligence may be developed in connection with a weak body and may entirely counteract its disadvantages. The general law, however, is that of the longer 'survival of the fittest.'[2]

§ 11. We have now mentioned as among the most prominent and controlling General Physical Inheritances, the following:—

Common Characters of Species.
Common Characters of Race.

[1] Ribot's *Heredity*, Part I. Chap. VIII.
[2] Darwin's *The Origin of Species*, Chap. IV.

Common Characters of Family.
Common Characters of Temperament.
Common National Characters.
Common Characters of Sex.
Health and Morbidity.

Other groups might be cited, but the above are of chief consequence. I shall not attempt either to trace the course of development of these influences or to follow their effects into mental states. This ground is largely covered by the science of anthropology, and although by no means out of place here, a full exposition of the operation of these transmitted organisations would extend this work beyond proper limits. I shall content myself, therefore, with mentioning the more important factors embraced under heredity, without attempting to delineate the courses of their action specifically or venturing to assign their respective quantitative values. This last presents an almost unexplored field to the future student of psychology.

§ 12. In tracing backward inheritances of organisation, we are referred from one individual to another and another indefinitely. In individual cases, it is very extraordinary to find any record kept of peculiarities of mind or body. We can hardly ever learn anything of scientific value, except by comparison of persons living—son with father and grandfather, for instance—and sometimes by aid of definite recollections of living persons. We may thus learn of family traits. Through political history we can also learn something of race and national characters; through natural history, of species and sex. When, after viewing the human race as a whole, we attempt to account for the genesis of the human organism, we are greatly embarrassed by the absence of definite and certain facts. All that can be said upon the subject in the present state of knowledge has been said by some of the most careful and thorough scientists the world has ever seen. There can be no reasonable doubt of the gradual evolution of all animal life from lower types, man from lower animal forms, these latter in turn from still lower, and so on till the beginnings of protoplastic life are reached. This we have gone over in Part III. of our work. But to attempt to trace back our specific physical inheritances to their definite sources is a task which seems entirely hopeless. All that can be obtained is general facts in various ranges of extent and probability.

§ 13. Still more subtle than any of the inheritances we have mentioned are those organisations of the nerve-system which give rise to the molecular motions which attend specific mental predispositions. Of these, however, we know little save through introsusceptive examination of mental states. We will, therefore, pass at once from the physical to the mental side of heredity.

GENERAL CAPACITIES FOR MENTAL EXPERIENCE.

§ 14. The problem of the connection of mind and body meets us at every turn. But it has proved the most insoluble of psychological problems. However far we may have been able to carry our discoveries of correlations or correspondences between body and mind, there have been at no time any facts brought to light which indicate the slightest approach to a scientific identification of the two. Admitting in the fullest details a qualitative and quantitative correlation between mental states and molecular nervous changes, there is just as wide a gulf between matter and mind as there would be without such correlation. It has already been postulated that we can have no knowledge of the substance either of matter or mind; consequently we have no means of knowing whether the two are the same or different. Moreover there is ever present as a primary fact of mental experiences a perpetual discrimination of self from not-self; this antithesis is presupposed in every conscious experience, and is nerve-eliminated; but self is known to us only as mind, not-self only as matter, or as attribute of mind through reflection. It seems thus that every attempt to identify mind and matter must always fail. Nevertheless, there is a connection of some sort between them, and apparently a mutual action and reaction. But a full discussion of the questions relating to this connection of body and mind must be relegated to philosophy. These are really the final questions of psychology, and can best be treated after we have completed our examination of the phenomenal characters of states of consciousness and fully traced their developments.

§ 15. If, however, the mutual exclusion of mind and matter be a postulate, in enumerating the organised inheritances which are factors in the production of states of consciousness, we must conclude that along with the bodily organism we inherit capacities for all the mental operations, that is capacities for feeling, cognition, and volition. We know that our physical organism is derived from the

organisms of father and mother. The parents we believe had mind; and it is sufficiently evident that we were not born with more than the rudiments of the mind we possess, but that from those rudiments our mind has grown to its present condition. Some capacity for mental development, accordingly, we inherit. What that capacity is or whence it arose we do not know, but at least it exists correlatively to the physical life of the conscious being on all the three sides of states of consciousness. We inherit capacities for feeling, knowing, and willing in all their varieties.

§ 16. It may be objected, to be sure, that all we inherit is a physical organism capable of movement and of receiving sensible impressions; that with movement arises feeling of movement, and this is the beginning of mind. But granting all this, one of two suppositions must be made. The first is that a movement and a feeling are of the same kind, and that the movement makes or is both the material and the efficient cause of the feeling, which, if true, is an identification of matter and mind. The other supposition is that a movement and feeling are different in kind, and that the two arise concomitantly, or that the movement is the occasion, a sort of formal cause, the *per quod* of the rise of the feeling. If this last be the truth we are driven to one of three results: either something can come from nothing, or there is a creative force in matter, or we inherit with our bodily organism a power active and passive for the experience and manifestation of feeling, volition and cognition. The third of these I believe to be the only tenable and self-consistent conclusion.

PREDISPOSITIONS TO SPECIFIC MENTAL EXPERIENCES.

§ 17. This class of organised inheritances runs into both of the two former, and hence does not raise, by an attempt to distinguish the mental and the physical, the questions of the connection of mind and body, or the origin of either. I mean to include under the above title whatever predispositions are inherited toward specific or particular states of consciousness, irrespective of whether their origin may be considered mental or physical. Factors which are usually considered physical and factors which are usually regarded as mental are both concerned in the product.

§ 18. We will consider Predispositions to Specific Mental Experiences under three subdivisions; namely,

1. Predispositions to Feeling.
2. Cognitive Predispositions.
3. Efferent Active Predispositions.

1. *Predispositions to Feeling.*

§ 19. Each individual is predisposed to certain states of consciousness, characteristically states of feeling coming from his inherited physical and mental constitution. On the physical side, these inheritances are the inheritances of species, race, family, sex and the like, which we noticed in our first division of this chapter. On the mental side they are exhibited as states of feeling.

§ 20. In the peripheral system there are inheritances which affect sensational experience in very perceptible degrees. Of course imperfection of an organ prevents many of the normal experiences which arise from a healthy condition, and this is frequently perpetuated. But where the organs are normal many peculiarities are noticed as transmitted from parent or grandparent to child, and indeed through races. Southern races have a much finer degree of tactile sensibility than northern. Variations in the sensibility to tickling may also be instanced. 'There are whole families that are insensible to this, while others are so sensible to it that the slightest touch will produce syncope.'[1] Acuteness or dulness of sight is often inherited; susceptibilities to colour in varying degrees down to colour-blindness are notoriously transmitted, together with all sorts of optical imperfections. The aptitude for or obtuseness to musical discriminations furnishes perhaps as remarkable instances of hereditary transmission as anything connected with sensational experiences. The likes and dislikes of smell and taste give other prominent examples. Acuteness of smell is transmitted in many animals, notably the dog, and in some races of men, as in the North-American Indians and some negroes. Dislike to some articles of food is often inherited, as the antipathy for cheese, noted by many authors, probably observed by most people in the course of their own experience.

§ 21. Those ento-peripheral, organic, or systemic feelings which give rise on their volitional sides to appetites are the results of organic inherited conditions. Here pain from deprivation and pleasure from gratification are certain results, made primary organic necessities of experience through predispositions organised in a long series of individuals; running back indeed to the

[1] Ribot's *Heredity*, Chap. II.

beginnings of life, since as life is organised the gratification of these appetites (at least the natural appetites) is indispensable to the continuance of animal existence.

§ 22. Emotional predispositions are frequently traceable. The same emotions, however, may not be instinctive in two different individuals, or, if instinctive, may be so in different degrees. Although the influence of predispositions is so blended with that of individual circumstances that it is extremely difficult to determine the degree in which the two classes are complicated, yet in general where, especially in early life, distinct and prominent forms of emotion are discerned as frequently recurrent in a person's character, an element of heredity may be presumed. Some feelings are so completely and thoroughly instinctive that they are developed prominently in direct opposition to education. Frequently peculiarities of emotional nature can be traced to a parent or grandparent, even where the descendant has been brought up under circumstances which would naturally lead to an entire suppression of all such characteristics; and sometimes when they are for the most part suppressed, they burst forth at unexpected moments in a manner wholly unaccountable except upon the supposition of inheritance.

§ 23. Many of the emotions manifested in early childhood are decidedly instinctive. Children frequently show pronounced tendencies, even in infancy, toward anger, jealousy, peevishness, hatred, mirthfulness, and other feelings. The different temperaments are early marked. Undoubtedly in many cases outside excitation or internal disturbance occasion these manifestations of feeling, but they not seldom occur under circumstances leaving little room for doubt of the influence of heredity.

§ 24. Natural affection is the most striking example of instinctive feeling. The love which a mother has for her child is not a matter of education, but is spontaneous. Education modifies, but neither produces nor eradicates it. Without certain sensations and associations in the individual experience, it could not become developed; but allowing the offices and value of these, in order to account for the certainty, irresistible strength and fulness of the emotion, an inherited, instinctive inclination is necessary. It is often superior in strength to the products of the strongest associations.

§ 25. The emotion of love between the sexes has a large portion of instinct involved. It is perhaps best illustrated in the

case of 'love at first sight.' Upon sight of the object, the emotion springs at once into fulness, and possesses the whole being. No association, no reflection, no observation makes it in any degree stronger. It seems to exist latent in the mental system.

§ 26. Pleasures and pains of all sorts generally contain an element of instinct which regulates their character or degree. This will be still further illustrated when we come to consider volitional movements. We have already mentioned the likes and dislikes of sensational experience. In emotional and intellectual experiences we observe the same things. Instinctive appreciations of the beautiful, the true, and the good may be traced. So a person who has a native high degree of pleasure in certain intellectual exercises to the exclusion of others, is frequently able to refer it to ancestral origin. In fine all our feeling-consciousness contains instinctive elements as predispositions to specific modes of feeling, sometimes very minute and sometimes very conspicuous.

2. *Cognitive Predispositions.*

§ 27. If tendencies to feeling are inherited, with them go tendencies to certain cognitive states. The strength and certainty of our fundamental discriminations are greatly enhanced by inherited tendencies. It is difficult to see how anything more than the first clear experience of motion and resistance is needed to raise to its maximum strength the discrimination between Ego and Non-Ego, though many repetitions of the action and reaction may be necessary before any clear persistent consciousness is developed. And the strength of representation must be influenced extensively in this way, a prompt and certain association of the different characteristics of phenomena being powerfully aided by inherited tendencies. So with all the fundamental discriminations and identifications which the mind makes in perception, as of distance, superficial area, and solidity. The delicacy, completeness and certainty of those fundamental cognitions, and the rapidity with which they were acquired, attest the presence of an inherited determination to particular associations.

§ 28. Moreover, we cannot explain the existence in the mind of a great deal of what is termed axiomatic and necessary truth without heredity. Such truths are held as necessary because they are the result of convictions organised in the mind. They

represent experiences not merely universal at the present time but universal throughout all past time. Consciousness is irresistibly predisposed to certain cognitions. All those propositions of which the negation cannot be conceived are of this character. Whenever anything is cognised as impossible, there is furnished an instance of heredity as determining cognition. The impossibility of conceiving the annihilation of matter or a limitation to space save by a resisting force, or the destruction of force, and similar impossibilities of thought, is fixed and certain in the individual mind from the first experience. So also the truth of propositions like 'two and two make four' is as certain to us as certainty can be from the beginning. The early inseparableness of associations on the part of the individual by which such cognitive states arise is the result of a long course of hereditary experience. When we come to deal with the products of cognition we shall have occasion for a full discussion of necessary and contingent truth. Consequently I shall in this place only advert to the fact that heredity is essential to the explanation of the original certainty of necessary beliefs and the postulates of knowledge, as such certainty occurs in the individual mind. We are so *organised* that we have no power to think or believe otherwise.

§ 29. The inheritance of particular aptitudes for special lines of cognitive association is a matter of ordinary observation. This is expressed by such common ascriptions of intellectual powers as 'He has a remarkable memory;' 'He has much native talent;' 'His imaginative powers are extraordinary;' 'His natural reasoning ability is very great.' While in these cases the influence of education and cultivation is considerable, still in all instances of what is termed *native aptness*, the hereditary element is predominant and necessary to explain the aptitude. Professor Ribot, in treating of Heredity of the Imagination,[1] gives an interesting list of names illustrating family transmission of talent of one sort and another, especially in the cases of poets, painters and musicians. He finds that in a given list of fifty poets, twenty had illustrious relatives; among forty-two painters, twenty-one were similarly connected. Besides, he shows the direct inheritance of the special forms of ability which distinguish particular eminent personages. Aristophanes had three or four sons in whom the comic poetical talent appeared. Coleridge had two sons and one

[1] *Heredity*, Part I, Chap. IV.

daughter in whom his peculiarities of intellectual character were noticeable. Murillo had two uncles and one cousin, painters of merit. Paul Potter's father was a landscape painter. In Titian's family there were no less than nine painters of merit. The Bach family in relation to music is regarded by Professor Ribot as 'perhaps the most distinguished instance of mental heredity on record. It began in 1550, and continued through eight generations. . . During a period of nearly 200 years this family produced a multitude of artists of the first rank. There is no other instance of such remarkable talents being combined in a single family. . . In this family are reckoned twenty-nine *eminent* musicians.' The list is continued to men of science, embracing Aristotle, his father and son; Jacques Bernouilli, with seven descendants distinguished in some branch of science; Jean-Dominique Cassini, astronomer, and his son, grandson, and great-great-grandson. It is also extended to men of letters, with many conspicuous instances.

§ 30. The intellectual aspects of the state of mind called *belief* should here be noticed as being affected by inheritance. There is a volitional element expressed by the phrase *preparedness to act*, which is implied in every belief; but representation furnishes the intellectual constituents. Most of the necessary truths at least, and probably all, can be viewed as beliefs. The postulate of the uniformity of nature most conspicuously involves belief. In perception even there is much belief. In the formation of these states of belief, hereditary predispositions all the time enter as important, and frequently as determining, factors.

§ 31. It is scarcely necessary to remark that in all those cases of inherited predispositions to feeling which have been just mentioned inherited cognitive aptitude is also concerned. Especially is this true of the perceptive elements of such experiences. Equally in volitional experiences are inherited cognitive tendencies requisite to explain the rise of those experiences. All this follows necessarily from the unity of states of consciousness, and the inseparability in experience of their different aspects from each other.

3. *Efferent Active Predispositions.*

§ 32. This class includes Unconscious Action in its two modes of Reflex and Automatic Action; and also Conscious Action of all the grades mentioned in the concluding portions of Chap. XXVIII. All are affected by heredity.

§ 33. Actions to which there is an inherited predisposition are commonly called *instinctive.* We will instance a few of the leading groups.

a. *The Locomotive Rhythm.* The alternation of the lower limbs in a forward and back movement is very noticeable in early infancy. When a child lies on its back and kicks, and when its feet are first put to the ground before it can balance itself, it alternates its legs in motion. If this movement were not instinctive, walking would not be so soon attained as it is. Moreover in the lower animals walking itself is clearly instinctive, and often, as in the case of the calf, is exhibited at once after birth. In this alternation of locomotive movements there is involved first a vibratory or pendulum motion of each limb, and then an alternation—in the case of quadrupeds a double alternation. This original tendency to vibratory movements is observable in many swinging motions of various parts of the body.

b. *Simultaneous Movements.*—The eyes from the beginning act together. So also is there simultaneity of movement of the two eyelids. And it is to be remarked that the movements which are especially predisposed to be associated involuntarily are those of the corresponding parts of the two sides of the body.

c. *Harmonious Movement.*—There seems to be a general instinctive harmony existing all through the muscular system, which subserves the requirements of animal evolution. This instinct causes the system to be brought more readily into harmony with the surroundings, quieting or rousing the feelings upon occasion. It is exemplified in a tendency to stretch all the limbs when one is stretched; also to a fixity of posture when gazing intently; in slow gestures accompanying slow speaking, and rapid animated gestures with fast or more energetic utterance.

d. *Self-Defence Movement.* The various actions which men perform when suddenly called to self-defence are very remarkable examples of instinct. The parrying of blows, the quick turns of the body, the movements of the limbs are all instinctive. These actions are very conspicuously instinctive in the lower animals.

e. *Expression of the Feelings.*—Very many of the expressions of feeling are instinctive, such as smiles, frowns, raising of the eyebrows, shrugging the shoulders, winking, nasal movements, compressing the teeth, rolling the eyes, and the like. A large class of these expressions we shall presently reach under the head of appetites.

f. *Vocal Exercises.*—Closely allied to the foregoing are local movements. These are often instinctive, as the first songs of birds, the first cries of infants in their cradles.

§ 34. To the above may be added other groups indefinitely. Instincts in the lower animals are very far-reaching. A typical example is afforded in the fly-catcher of Dr. Carpenter, which 'immediately after its exit from the egg has been known to peck at and capture an insect—an action which requires a very exact appreciation of distance, as well as a power of precisely regulating the muscular movements in accordance with it.' Instinct marks a grade above simple reflex and automatic action. The former shows a greater complexity of action, and with this increasing definiteness. Reflex and simple automatic actions are instinctive, but the term *instinct* as usually employed indicates a combination of induced actions, so complex and definite as to appear to be performed for a purpose, but yet without apparent knowledge or perception of any end for which they are done.[1] In this limited sense, over and above the reflex, instinctive actions are combinations of actions which have become organised in the system, and the dispositions to which are transmitted from parent to offspring. Compound reflex action expresses their character very well, though the automatic element is not wanting, using the term *automatic* as I have employed it in this work. In the other sense, that of *machine-like*, the term is peculiarly applicable to all instinctive actions.

§ 35. The greater part of instinctive actions are directly or indirectly related to the appetites. These are states of consciousness in which, when they are developed fully, *desire* is the prevailing characteristic. In a former chapter I have outlined the constituents of states of desire (Chap. XXVIII. § 13). We there found that they implied a state of pain, together with inhibited movement which is represented as pleasurable. The basis of appetite is an organic want indicated by a state of mental uneasiness passing into more severe pain unless relieved. With this organic feeling have become associated and organised in the system certain movements tending to relief from the pain. These appear in the individual as instinctive actions prompted by the feeling of pain. Just so soon as relief is once experienced, the movements which occasioned it enter into consciousness to be represented on a recurrence of

[1] Shadworth H. Hodgson's *Time and Space*, Part I. Chap. III. Sec. 23.

the appetitive pain. Then with this repeated pain arises a represented pleasure, an end of action, to realise which movements are directed.

§ 36. Appetites, therefore, may be regarded as states of feeling with volitional tendencies, or volitional states with feeling accompaniments. The word, however, indicates a greater prominence of the volitional. By a curious application of language some of the names commonly used to mark appetites are names of the feelings which appetite prompts to avoid rather than to seek, as *hunger* and *thirst*. As just noted, in connection with appetite are feelings of pain, pleasurable feelings of the end sought, and volitional appetencies toward that end. We will now enumerate the leading appetites.

Integrity of the Body and *High Nervous Vitality*. These terms express the appetite for health and self-preservation. It is a general appetitive craving only appreciated in diseased or weak states of the system. It is not, like the most of the appetites, of periodic recurrence, and is not distinct, but includes many of the other appetitive tendencies. It is more general than any other. The instinctive movements it occasions are those of self-preservation and conservation in whatever direction there seems to be need in the individual instances.

Light and Heat. —The organic necessities of the system require some degree of light and heat. When we are deprived of these there is an appetitive craving for them in proportion to the completeness of the deprivation.

Air.—Where respiration is impeded, either through interference with the respiratory action or through insufficiency of pure air to breathe, a very strong appetite is developed. Here we have periodicity plainly exhibited. The regularity of the respiratory movement is a measure of this recurrence of appetitive tendency.

Exercise. —This appetite refers to the muscular system, and is quite strongly marked. It is most thoroughly appreciated where movement of the limbs is prevented, as when a man is bound hand and foot. Such confinement soon becomes almost intolerable. In less degree, but still very evident, is irritation arising from any failure to move or exercise the muscles of the body

Repose.—In like manner the system demands repose after exercise, as it requires exercise succeeding repose. The tired

feeling after exertion is sure to come sooner or later; and if rest is interfered with the pain becomes extremely severe. Complete repose is found in sleep, 'tired nature's sweet restorer.' The periodicity of the desire for sleep is noticeable in all individuals from the earliest infancy.

Repletion and Digestion.—Hunger and thirst arouse the strongest cravings for food and drink to produce the comfortable and comforting feelings of repletion, digestion, and assimilation. All of the predatory actions are connected with this appetite. At intervals desire for food and drink is excited, and soon becomes imperative unless gratified. What is best for aliment is not so much a matter of instinct as of education; yet inherited appetites for particular articles are not uncommon. This inheritance extends to artificial appetites, as that for alcoholic liquors; young children are sometimes found with a decided appetite for strong drink. Thirst and hunger are the earliest wants of our experience, though the need of warmth and sleep are doubtless very soon developed. 'To bring together and make to unite the sensation of the appeasing of hunger with the acts of sucking, prehension, masticating, and swallowing is perhaps the earliest link of volition established in the animal system. This is the first case of action for an end, or under the prompting and guidance of a feeling, that the newly-born infant is capable of.'[1]

Sex.—Although the appetite for sexual enjoyment profoundly affects the individual life, its gratification ministers not to a requirement of the individual but of race existence. Hence, however strong the appetite may be, its denial does not involve so serious consequences to the individual as the denial of the demands of the other appetites. In this sense it does not represent as strong necessities as the others; but in point of pervasive influences, determining sentiments and character, it is in no wise behind the rest.

Society.—There exists an appetitive craving for the amicable presence of other beings like ourselves. There is an organic social connection of similarly constituted individuals, out of which the wants of each are better subserved and the development of the race also promoted. Hence has arisen an appetite for the society of others which is as natural as any other above mentioned. When we come to consider pleasures and pains, ample illustration

[1] Bain.

of the workings of this appetite will be given, with some evidences of its primary character.

§ 37. The foregoing are natural appetites. In addition there are many acquired appetites. The most conspicuous of these are the appetites of *routine* or *habit*, impelling a person to an accustomed order or cycle of actions, and making him miserable if broken up or interfered with. Such appetites vary of course with different individuals, but they appear to a greater or less extent with every one.

§ 38. It will have been seen by the reader that not all of appetite is inherited. The promptings to appetitive action are organic or systemic sensations, but these sensations arise through inherited tendencies of the organism in its course of evolution. On the efferent side the great majority of the movements and combinations of movements to relieve appetitive craving are instinctive.

§ 39. States of consciousness exhibit in their volitional aspects a multitude and great variety of inclinations, choices, determinations, and habitual actions, which are included under the comprehensive term *predispositions*, and are not reckoned technically among instincts or appetites, though, if predispositions at all, they are certainly instinctive and often appetitive. They can frequently be accounted for by the process of mental development of the individual in its intercourse with the environment, but it does not seem possible to explain them wholly or to explain all of them in this way. Hereditary tendencies are plainly exerting influence. Both the choice and practice of vocations often exemplify the truth of this. The popular belief on the subject is shown in such expressions as 'He has found his calling.' In speaking of cognitive predispositions (§ 29) we noticed the same thing on the intellectual side. In this connection moral tendencies, toward good or evil practices, ought to be mentioned. Sometimes there seems to be innate a tendency to a well-balanced life; sometimes a tendency to general depravity, or to special courses of evil. Here we observe a good disposition, there a bad. Inherited tendencies to crime have at many times and in many places attracted the attention of students of social science, of moralists, and practical philanthropists. Analysis of these tendencies, however, always shows their connection with the fundamental appetitive demands of the organism.

§ 40. As we proceed with our study we shall discover how

states of consciousness in their differentiations and integrations produce and organise dispositions, sentiments and character, which, subject to modifying forces, are transmitted to offspring and reappear in the children as organised inheritances. That this should be true is required by the general law of evolution and dissolution which pervades nature, organic life as well as inorganic existence, the phenomena of mind as well as the phenomena of matter.

CHAPTER XXXI.

ENVIRONMENT.

§ 1. WHEN we were examining the material conditions of states of consciousness we learned that life was the evolution and integration of an organism; and the process of life we found to be the continuous adjustment of inner (the organic) to outer (the environing) relations. When we were studying the genesis of states of consciousness, we concluded that all sensations grew out of mutual actions and reactions of the organism and the environment. We also noted that the beginnings of consciousness are sensations, and observed the multiplicity and variety of sensations. We substantially ascertained that all states of consciousness are presentative and representative, of which the presentative elements arise somehow from the action of environing forces, and the representative from automatic elaboration reacting upon the environment. The environment thus determines our sensations, and its importance as a prime factor both in the genesis and development of states of consciousness is therefore established.

§ 2. In this examination of the material conditions and of the genesis of states of consciousness we found ample and detailed illustration of the methods of action of environing forces. We need not go over the same ground twice. This chapter, consequently, may be very brief. What we have to do now is merely to recall and gather together some of the most general truths respecting the influences of the environment, and to call attention to one set of agencies not previously made prominent.

§ 3. In considering the material conditions of states of consciousness we distinguished between the external or cosmical

[illegible] of animal [illegible] [illegible] of the action of [illegible] physiological environ[illegible] The former is [illegible] of the organism itself. [illegible] alternations of struc[illegible] activities of the [illegible] at length. Hence, [illegible] development of [illegible] account of the [illegible] of material [illegible] upon an element of [illegible] importance as an influence upon mental life, [illegible] should have a [illegible] organic or social forces or powers, [illegible] beings than our[illegible] [illegible] the complex [illegible] mind needs no argument. We shall [illegible] the environment with [illegible] namely the Inorganic, the Organic, and the Super-Organic Environment.

§ 2. But these divisions after all are merely theoretical and [illegible]. The separations made by them are only relative. Inorganic forces are involved with organic in their action upon the individual organism. Organic life is necessary for the suste[illegible] of organic life, and life itself is dependent upon inorganic conditions. Social influences proceed from organic beings, and are affected [illegible] by the circumstances of the inorganic world. Society in cold climates is not the same as in warm, nor is it alike in a fertile and a sterile land. I shall not here attempt to exhibit separately the agencies of these three environing kingdoms, but will present some roughly-marked groups of incident forces modi[illegible] the development of states of consciousness.

§ 3. Among the movements of nature, those having the most [illegible] both upon the duration and the character of [illegible] are the operations of the life-giving and sup[illegible] The existence of consciousness, so far as we know [illegible] the preservation of life. All the organising, [illegible] forces are most immediately concerned [illegible] of life, and are thus intimately connected [illegible] mind. And not only is their influence to

be marked in the direct support of life itself, but also indirectly in the storing-up of vitality. A man's energy of mind and character is greatly modified by the vital force which he has in reserve. Besides what is absolutely necessary for the maintenance of life and for conserving purposes, the character of the individual is always modified, and his whole life affected, by the degree in which these forces are brought to bear upon him. The life forces are dependent upon the sun, and the difference between those men who have been brought up in the ordinary sunlight and those who have grown to manhood in mines without having ever seen the light of day is a good illustration of the power of those forces in controlling mental growth through the development of the body. They induce health, confidence, buoyancy, determination and strength.

§ 6. Although we are treating of evolution rather than of dissolution, it may be well to mention in this place the effect of the forces of dissolution in nature, the successions of vegetal and animal death upon life, in controlling psychical life. The deteriorating influences of disease within the organism itself make themselves apparent in diminishing the energies, dulling the intellect, and blunting or otherwise changing the feelings. The course of nature in successions of life and death suggests the certainty of death and, though not the sole cause, raises thoughts and hopes of a future life, stimulating to such actions and courses as may be deemed best to prepare one for an existence beyond the grave, causing all manner of speculations as to the character of such a life, occasioning imaginations, desires, fears, remorse, joy, determinations and purposes of various kinds.

§ 7. So also the reproductive forces in nature, besides the appetites to which they give rise within the organism, awaken hopes and purposes of reproducing and perpetuating one's self by impressing upon the environment in one way and another the marks of one's existence. Furthermore, it may be remarked that the beliefs respecting a future life receive strong reinforcement from consideration of nature's order in reproduction.

§ 8. Taking a very general view of the subject, two laws of nature have a transcendent character as affecting the operations of mind and as rendering possible both stability and progress. The one is the uniformity of nature, the other the continuous differentiation going on in nature. The uniformity of nature's laws is the ground for all certainty whatever. All science depends

media and the internal or physiological media of animal life. These same divisions can be preserved in treating of the action of environing forces. There is an internal or physiological environment, and an external or cosmical environment. The former is determined by the latter plus the reactions of the organism itself. These reactions come either from organised inheritances of structure with attendant functions, or from automatic activities of the organism (themselves indeed partly inherited, at least). Hence, in dealing with environment as a factor of the development of states of consciousness, we need not take a separate account of the internal or physiological medium. But in treating of material conditions, we had no occasion to lay stress upon an element of the environment, which rises into great importance as an influence upon mental life, and which for many reasons should have a distinct place. I mean the super-organic or social forces or powers, which arise from the existence of other conscious beings than ourselves. That such influences powerfully affect the conscious states of every being with mind needs no argument. We shall then have three departments into which the environment with its forces and influences may be subdivided, namely the Inorganic, the Organic, and the Super-Organic Environment.

§ 4. But these divisions after all are merely theoretical and artificial. The separations made by them are only relative. Inorganic forces are involved with organic in their action upon the individual organism. Organic life is necessary for the sustenance of organic life, and life itself is dependent upon inorganic conditions. Social influences proceed from organic beings, and are affected too by the circumstances of the inorganic world. Society in cold climates is not the same as in warm, nor is it alike in a fertile and a sterile land. I shall not here attempt to exhibit separately the agencies of these three environing kingdoms, but will present some roughly-marked groups of incident forces modifying the development of states of consciousness.

§ 5. Among the movements of nature, those having the most essential influence both upon the duration and the character of our conscious states are the operations of the life-giving and supporting forces. The existence of consciousness, so far as we know it, depends upon the preservation of life. All the organising, heat-evolving, assimilating forces are most immediately concerned in the maintenance of life, and are thus intimately connected with the operation of mind. And not only is their influence to

be marked in the direct support of life itself, but also indirectly in the storing-up of vitality. A man's energy of mind and character is greatly modified by the vital force which he has in reserve. Besides what is absolutely necessary for the maintenance of life and for conserving purposes, the character of the individual is always modified, and his whole life affected, by the degree in which these forces are brought to bear upon him. The life forces are dependent upon the sun, and the difference between those men who have been brought up in the ordinary sunlight and those who have grown to manhood in mines without having ever seen the light of day is a good illustration of the power of those forces in controlling mental growth through the development of the body. They induce health, confidence, buoyancy, determination and strength.

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§ 8. Taking a very general view of the subject, two laws of nature have a transcendent character as affecting the operations of mind and as rendering possible both stability and progress. The one is the uniformity of nature, the other the continuous differentiation going on in nature. The uniformity of nature's laws is the ground for all certainty whatever. All science depends

upon the consistency of operation which nature displays. Were not those laws more immutable than Median or Persian statutes, no knowledge whatever would be of any avail. The order of our lives, our very happiness and being, rest upon the assurance that nature is uniform. Did we not expect that the sun would rise and set to-morrow and again; that winter would succeed summer and summer winter; that the corn planted would in due time bring forth a harvest; that food would support life and water quench thirst; that upon foundations laid firmly to-day the superstructure reared to-morrow would stand and defeat the winds and rain; that electricity would still send the winged message, and steam propel the thundering train and the majestic steamship; that the apple would still fall to the ground but the stars keep their places in the heavens,—unless these things were still to be expected in systematic recurrence or with continued certainty, what calculations could man make, what order could he introduce into his life, what expectation could he have that for him or for the world any to-morrow would ever come? The whole fabric of mental life rests upon the uniformity of nature's laws.

§ 9. On the other hand not less conspicuous is nature's variety in the midst of uniformity. Heterogeneity in unity marks the whole exhibition of nature. Multifold and endless is that diversity. No two leaves alike; no two animals without their individual peculiarities; no two days but that one bears its own marks distinguishing from the other; no two seasons alike; no co-existences, no sequences in nature but bear modification with reference to all others. Out of this diversity springs the infinite diversity of human life—diversity of body, diversity of mind, diversity of situation. The combinations of mental phenomena reproduced and reconstructed are all the time made more complex and various in the degree of variety in the environing forces. This is true in all the relations of consciousness, both with respect to individual and social development. All our anticipations of excellence and eminence, all our hopes of improvement and progress of whatever sort, are founded upon the differentiations in the order of environing nature. As the diversities are practically infinite, so the possibilities seem boundless. 'All flesh is not the same flesh; but there is one kind of flesh of men, another flesh of beasts, another of fishes, and another of birds; there are also celestial bodies and bodies terrestrial; but the glory of the celestial is one, and the glory of the terrestrial is another. There is one

glory of the sun, and another glory of the moon, and another glory of the stars; for one star differeth from another in glory.' But it is rather for the poet, the painter, and the moralist to reveal and dwell upon nature's variety, and to them we will leave the fruitful theme.

§ 10. Among the special circumstances of environment which modify conscious life, climate is worthy of prominent mention. We have already noticed the effect of inheritances of blood and temperament. These differences of temperament in family, nation, or race are wrought and modified very largely by climate. A man reared in a torrid is very different from one reared in a frigid zone. Wet and dry climes also produce decided differences. It is true that if two persons in opposite climates could be reared with very similar training, and pursue the same courses of mental education, the climate influences would be in a great degree outweighed. They would not, however, be abolished even as affecting externally the individual character, much less when climatic causes which have been constantly operating through ancestors are continued. How far the effects of such climatic agencies can be nullified and abrogated, and in how long a time, are questions that are of great interest to those seeking the elevation of inferior races.

§ 11. Associated with the matter of climate is the educating effect of scenery. People reared and dwelling among mountains, for example, exhibit characteristics in kind or degree distinguishing them from dwellers upon the plains. It is sometimes said that those who have wide prospects have broader ideas, and that those whose vision is limited by encircling hills are 'narrow minded.' Again, it is sometimes remarked that the spirit of liberty dwells among mountaineers; that they are more jealous of their freedom, and withal more courageous and manly than their contemporaries who do not breathe the mountain air. Undoubtedly differences of surrounding scenery do have their influence in just the directions referred to in the two sets of examples cited, as well as many others; but those influences are often and easily nullified by education.

§ 12. Different surroundings of physical things in the daily life of men determine differences that association perpetuates. Two men living in the same house may even on the same day be influenced by nature in different ways and in degrees that may be traced. One takes a walk, the other stays at home; different scenes attend each. The one who takes the walk may meet with some experiences which may have an appreciable influence upon

his life ; while other occurrences, of a totally different nature, to the one remaining at home may be equally well marked. In this connection may be noticed abnormal occurrences in nature, accidents or sudden unforeseen perils escaped from, but only after effort ; any one of which may make its permanent impression upon the individual, modifying his habits and character.

§ 13. Language is an always ready and an unimpeachable witness to the dependence of the mind upon the environment for its modes of thought. This appeared very fully in our analysis of language in the Introduction. But to impress the fact again, let us listen for a moment to the words of Locke : 'It may also lead us a little towards the original of all our notions and knowledge, if we remark how great a dependence our words have on common sensible ideas ; and how those that are made use of to stand for actions and notions quite removed from sense have their rise from thence, and from obvious sensible ideas are transferred to more abstruse significations and made to stand for ideas that come not under the cognisance of our senses ; e.g. *to imagine, apprehend, comprehend, adhere, conceive, instil, disgust, disturbance, tranquillity*, etc., are all words taken from the operation of sensible things and applied to certain modes of thinking. *Spirit*, in its primary signification is *breath* ; *angel*, a *messenger* ; and I doubt not but, if we could trace them to their sources, we should find in all languages the names which stand for things that fall not under our senses, to have had their first rise from sensible ideas. By which we may give some kind of guess what kind of notions they were and whence derived, which filled their minds, who were the first beginners of language ; and how nature, even in the naming of things, unawares suggested to men the originals and principles of all their knowledge ; whilst to give names that might make known to others any operations they felt in themselves, or any other ideas that came not under their senses, they were fain to borrow words from ordinary known ideas of sensation, by that name to make others the more easily to conceive those operations they experimented in themselves, which made no outward sensible appearances.'[1]

§ 14. The office of language in the communication of ideas introduces us to the influences of the super-organic or social environment. The sociological sciences—History, Anthropology, Ethnology, Politics, Jurisprudence and Ethics, and their connec-

[1] *Essay on the Human Understanding*, Bk. III. Chap. 1 Sec. 5.

tions, exhibit the relations of men as members of a social organism, and deal with the courses of evolution and dissolution of such organisms. Most of the objects for which men strive are social. Power, wealth, reputation, liberty, character, all involve chiefly social relations. The competitions of life are struggles between men ; the sympathies and alliances are between members of a community. Personal development is dependent upon education from others, and from the recorded experiences of others. Personal liberty is governed by laws of the state. The directions in which effort may be put forth are regulated by the real or fancied wants of the community. And in addition to the restraining and directing effects of positive laws, the special circumstances of social life are of great consequence. A man's personal habits are largely determined by the society in which he moves, his acts by public opinions, his ideas even by the spirit of his times, his feelings by the sympathetic or antipathetic feelings of his fellows among the community in which he dwells. The thraldom of custom, the persistent and obstinate adherence to motives that have no justification, the retention of obsolete laws, oftentimes injustice and unreason, all manifested everyday about us, attest the influence of social circumstances. On the other hand, through the tendency to be governed by social prejudice good institutions are often conserved, gentleness and refinement propagated, and man elevated. The family, the community, the state, the nation, the race—all exert their influences as social factors upon the development of states of consciousness.

§ 15. Finally, we will instance the evidences of adaptation and design in the order of nature as furnishing the most powerful argument to minds of all classes in support of the belief in an intelligent Author and Governor of Nature. No one idea has played any more important part in the history of mind. All the considerations relative to a future life have increased force given them by this belief in a Divine Power; indeed, from the latter comes all their vitality. All the stimuli to a proper control of life are heightened in their effect; the religious emotions are strongly developed; society directs its movements with reference to religious ideas; and all the organic connections of similarity of belief and worship have full sway. In no phase of history, in no corner of the globe, among no people, however rude and barbarous, is there not trace of the influence of ideas of God. The modifications, therefore, which are wrought upon states of consciousness

through this means must be considered as in due measure owing to the order of environing nature.

§ 16. The agencies of the Environment, then, are Cosmological, Biological, and Sociological. The expression of the action of these factors is found in laws of nature. The cosmological and biological laws, so far as they are necessary for this work, have been mentioned in former parts. The sociological I shall not attempt to set forth even in outline for two reasons: the one, that the science of sociology is still in its infancy, and its laws less settled than those of life or of the cosmos generally; the other, that sociological laws after all are dependent for their formulation and explanation upon psychological laws, since society is made up of individual units, whose whole development is governed by the activities of mind in reaction upon the environment, and hence the laws of exercise of those activities in a measure determine the social states and changes. Sociological evolution follows, and is based upon psychological evolution.

CHAPTER XXXII.

CONSCIOUS AUTOMATIC ACTIVITY.

§ 1. THE mind is a source of power. It is self-active. It employs its activities both in resisting or balancing incoming influences, and in putting forth initiatory action upon or against the environment. It also employs its power in determining its own states, at least to some degree, independently of the action of other factors. Of this self-activity we must take account in enumerating the agencies through which the development of states of consciousness is accomplished. There are various directions in which conscious automatic activity exerts its power, and these we will now consider separately.

ATTENTION.

§ 2. When any state of consciousness arises, there is a greater or less concentration of the mental activities upon it, which we indicate by the term *Attention*. It is the first movement of automatic activity in the direction of integration. In fact, attention is the process of cognition itself, of passing from the diffused

indefinite consciousness of feeling to the concentrated definite consciousness of cognition, the movement of the mind from feeling-consciousness to thought-consciousness. To have a cognition, therefore, implies some degree of attention.

§ 3. But there are all degrees of attention, from a mere passing cognition to concentrated thought. It is the superior concentrations that are commonly held to mark attention. I behold a landscape, and while the whole surface of the scene is before me and engrosses attention in a degree, some prominent points attract in a much higher degree and are said to 'fix' the attention. In the train of passing events some detain the attention, while others pass all but unheeded. So definitely may the attention be fixed that the mind is really unconscious of all other passing impressions than the one upon which there is especial absorption. But, though the degree of attention varies, the process exists, and is the same with every cognitive experience, the differences being in the different quantities of mental power concentrated in the several instances.

§ 4. Were it not for attention, there would be no *states* of consciousness cognisable as such. Attention, so to speak, holds the mind still, inhibits outward movement except to realise a desire, and occupies the mental energies. It is mental power exercised to augment the pleasurable in the present impression and to inhibit all else. It is a heightened reaction of the mental activity, an automatic increment of original stimuli moving toward integration. As before said, it is a part and the beginning of the integrating activity of mind.

§ 5. Attention may be either Presentative or Representative; that is to say, it may be directed toward presentative impressions or to representations, and to all varieties of combination of the two. And whether it be presentative or representative it is always the same thing, both as to the process itself and as to the mode of action.

§ 6. The degree of attention varies in the ratio of the quantity of automatic power evoked, and this in turn is determined as to presentative states by the quantity of sensation; as to representative by a variety of influences which we shall presently consider. We saw in a former chapter (Chap. XXVI.) that quantity of feeling had three modes, namely intensiveness, or acuteness, extensiveness, or volume, and protensiveness, or continuance. Sensation in all these three modes of quantity is governed by the structure

itself, that is, by inheritance and individual growth; and by impinging forces, that is, by the environment. The processes of growth are processes of the physiological environment; so that really we may reduce the causes of varying quantity of sensation to environment and heredity. In the case of representative states we shall find a proneness to represent the pleasurable, and that the degree of attention is controlled by the amount of pleasurable feeling attendant upon a given representation, or, as it has been expressed, by the *interest* we have in such representation.[1] The quantity of pleasurable interest, then, is chiefly determinative of the degree of attention to representative states, but not wholly so, as a quantity of feeling may be roused by painful association sufficient to engross attention.

§ 7. Since representation is a necessary part of all conscious experience, it follows that representative attention interacts with presentative. It is also true that the two counteract. The force of presentative impressions is often lost from the devotion of attention to the train of representations, or to particular representative states. It is equally the case that attention to the presentative interferes with attention to the representative. We may become habituated to attend to the presentative in preference to the representative, or to the representative over and above the presentative.

§ 8. In the case of both presentative and representative experiences, the attention is often detained by the quantity of feeling, irrespective of the quality as to pleasure and pain. In representative experiences, however, the volitional movement toward pleasure and away from pain tends to incline attention to the pleasurable. Consciousness aims to exclude from itself painful states. Automatic activity is always directed toward the retention of the pleasurable and the repulsion of the painful. So, when there occurs a painful impact upon the organism, the attention is fixed by the intensity of the stimulus. The automatic power from the centres reacts upon the impinging force in our attempt to integrate the new state with the states already organised. Integration, however, being impossible, since the activities of repulsion are aroused, the attention is diverted to the representation of those actions and states which afford escape and relief from such pain. A redintegrated state is formed embracing the cognition of what caused the pain, the represented means of relief and

[1] Shadworth H. Hodgson.

their attendant feelings of pleasure. Upon this redintegrated state the attention is fixed, and an end of action is thus formed, which the efferent activities seek to realise. The attention is, indeed, detained by painful presentations, but is at once diverted to pleasurable representations of relief. If the efforts to remove the pain are not successful, the same process is repeated; the attention is forced to recur to the painful experience, and is again drawn off to representations of relief leading to new efforts. This movement continues till the pain is relieved or becomes so great as to abate movement altogether and destroy consciousness. Contrariwise, when the presentative impact is pleasurable the automatic reaction coalesces with and assimilates the impinging force. The attention in such a case is detained with the presentation; the latter is assimilated with cognate representations called up, and the attention passes to the representation, and returns to the presentation according to the relative degree of force involved in the impinging activity and the automatic. But sometimes the force of association and representation of association is so great as to create a persistence of ideas even when painful, spite of volitional efforts to remove them. The automatic power works in a circle, and always comes around to the same point. Action is paralysed and prevented save to represent the detaining experience or its associations. The mind is concentrated upon the present representations by the quantity of feeling aroused, not by the degree of pleasurable interest.

§ 9. From the foregoing it will be seen that the office of attention is essentially introsusceptive. It selects and draws in material to be assimilated and integrated. It draws the mind to an object, and holds it till the integrating activities can assimilate it with the mental life or extract from it all that is assimilable. It accomplishes repulsion also, but by setting in motion the machinery of repelling through exciting a desire for a state of experience brought about by excluding and forcing away the offending impression or object. As all physical introsusception is the beginning of assimilation, so all attention is the initiatory movement to mental integration.

ASSOCIATION.

§ 10. When the self-activity of mind has directed its attention to simultaneous or successive presentations or representations, in

the very process this self-activity works out another result, not indicated by the term *attention*, though really implied in it. This is a segregation and unification of similarities in the experiences. Such a process we designate as *Association*.

§ 11. Association is the assimilation of contiguous states of consciousness. It is hence distinctively an operation of integration. When impressions occur the mind's activity seizes upon their points of likeness, and fuses them into a whole by their similarities. This may be done with a number of simultaneous impressions, or with impressions in immediate succession, or both.

§ 12. In the General Analysis of States of Consciousness which we made at the outset we found that Consciousness of Agreement and Difference was a fundamental element essential to consciousness itself (Chap. IX.). The process of cognising agreements in the midst of differences is association; and hence association is an essential part of conscious life, never absent, indeed, where there is consciousness at all.

§ 13. Association concerns both presentations and representations, and combinations of them. Its course then follows the divisions of cognitions, feelings, and volitions which we have noted in connection with the degree of representativeness. Association, therefore, may be regarded as presentative when it deals chiefly with presentative cognitions, and as representative when its subject-matter of integration is representative cognitions. Subordinate to these greater divisions we may regard association as presentative-representative when it combines presentative and representative states; and again as re-representative when it accomplishes the higher and more complex integrations.

§ 14. It is obvious that two classes of conditions must influence the completeness of integration wrought by assimilation, namely, propinquity of objects and degree of their homogeneity. Two objects which are near together are more readily associated than two more remote objects within the reach of the associating process. It requires more of an effort to connect two objects separated by a number of other objects, than two which are lying side by side. Again, two objects which are homogeneous, presenting many points of resemblance, are more readily associated into one whole than two objects which are more heterogeneous. A greater degree of homogeneity will oftentimes prove superior to propinquity, and cause an assimilation of more remote objects rather than of near. Propinquity affecting association may be

either the propinquities of simultaneity, or nearness in an order of succession. In either case representation is involved.

§ 15. These two sets of conditions determining association have usually been regarded as two separate modes of association, namely, by contiguity and by similarity. But it is impossible to make out two independent modes. All association implies identifications, and also contiguous things to identify. Perception is not complete, as we shall hereafter see, without association of similars, and the farthest reach of identifying power only results in bringing its objects into mean proximity. The truth of the matter is that the associating process is at all times one and the same. It is, as stated above, a process of assimilation of contiguities.[1]

§ 16. Association is an ultimate fact. We are not able to explain why the mind associates similars, except to refer the fact to the general law of evolution, of which it is an illustration. We observed in relation to physical life that the central organic process was assimilation, carrying with it integration and then differentiation in alternation. So it is with psychical life. The course of conscious existence, when viewed introspectively, is a course of integration and differentiation, without which consciousness ceases to be. In the inorganic world, in organic life and in mental life, there is a continuous progress from the simple indefinite and homogeneous to the complex, the definite, and the heterogeneous, implying alternate differentiation and integration. The final cause of all this we are not competent to know or inquire. That it is, we are certain; and association is a part of this process.

§ 17. The association of objects in experience involves the cognition of residues of the experience which are not assimilated, or which are less assimilated, and from which the associated aggregates are distinguished. Consciousness of agreements implies consciousness of differences. The more complete the association of homogeneities, the sharper will be the contrast with the heterogeneous matter which is left. The contrast will be as much a part of the cognition as the associated whole. It usually happens that in a given experience there are different groups of associations, some being principal and others subordinate, some being more complete integrations and others less complete. There is ordinarily a general ground of resemblance marking off an object from

[1] See the admirable analysis of the laws of association in notes by J. S. Mill and Professor Bain to Chap. III of James Mill's *Analysis of the Human Mind*.

other objects which gives the cognition of a whole; then there are subordinate associations of minor similarities in the midst of differences which give separations of parts, but all included within the whole.

§ 18. The view of association here exhibited raises an inquiry the answer to which is necessary before we can make the laws of association of any avail in explaining the development of states of consciousness. Having given associations, what determines their recurrence? This is substantially the same question, which we found to be of so much importance at the point where we left off considering the genesis of states of consciousness: the query, What determines representative states? Of course the order of events in the environment controls presentations, and thus furnishes presentative contiguities for assimilation, but if this were all there would be no elaboration of knowledge or feeling possible. We may go farther, as we have already seen, and assert that there would be no consciousness at all in such a case. Representation is an indispensable factor of conscious states. This being so, it is of vital importance to ascertain under what laws and conditions states of consciousness are represented. Given many presentative experiences which have so made their impression upon the mind as to be susceptible of recall by the process of representation, what causes one to be represented at a given time rather than another? The environment presents one set of contiguities, the representative power another. What are the conditions of representations

REPRESENTATION.

§ 19. The representative activity is predominantly differentiating. The directions of self-activity which we have already noticed have been characteristically integrating: but representation takes place when there is some felt insufficiency in the existing state; some uneasiness, some want which needs to be supplied. Then there is a movement for change, and the representative power supplies a new state, brings up, so to speak, material for new integrations. This process of change goes on continuously, and is, equally with the integrating processes, a necessity of consciousness. Consciousness of differences, of successions, is an essential part of conscious psychical life (Chap. IX.).

§ 20. Representation, like association, is an ultimate fact. This has been seen in the chapter last referred to; we there

noticed that the experience of cognised representation is primordial. It is not merely consciousness of differences or of successions nor is it both together. It is consciousness of something as represented; involving a belief that the experience at a prior time came within consciousness. The object is not alone cognised, but it is re-cognised.

§ 21. To ask why the process of representation is all the time going on, is to ask why consciousness exists. There is no answer to such a question. Our inquiry is and must be limited to the laws which govern the representation of one state or one group of states rather than others at a given time or under given circumstances.

§ 22. Representation is the reproduction in consciousness of past experiences, though in fainter degree than they originally occurred. It implies a representation of those experiences in the order in time in which they occurred, and likewise with all their co-existences. In fact, representation imports an activity producing a copy of these past experiences. Vivid sensations are represented with more vividness than faint ones; contiguous objects are represented as contiguous; associations are represented as associations; contrasts as contrasts; objects attended to are reproduced with a relatively greater amount of attention in the representative train. The general law of representation is simply that the automatic activity of mind tends to represent past states of consciousness in all their relations, as they originally occurred. Were there no interfering influences this would be the sole law of representation. But there are interferences constantly affecting the operation of this law.

§ 23. The first and most conspicuous influence is that of the environment, cosmological, biological, and sociological. New impressions from the afferent nerves are all the time obtruding themselves upon consciousness, and occupying the attention. These come in clusters and groups, many being simultaneous. They augment one another and inhibit one another, and upon them the associating activity is compelled to work. The reaction of mind-forces is in proportion to the strength of the impinging forces. We have heretofore enunciated as a statement of fact that an impression once made upon the nervous structure having its correlative mental state effects a modification of that structure by which any re-excitation of the affected portion revives the original mental state in greater or less completeness. We also saw that the

re-excitation need not be a repetition of the original stimulus, but it may arise from other stimuli, either of the environment or automatic. When, therefore, a present impression arises, it affects on the physiological side certain tracts; if these have been occupied before, the new impression tends to revive and reproduce the past impressions which have been registered in those tracts of the organism. Since the new and the old employ the same portions of the structure, having functional likenesses also, however the functions be set in motion, the result is a homogeneity in the states which are generated. The state of consciousness produced by the new stimulus evokes into contiguity with itself its cognate states of past experience. In other words, present states of consciousness tend to revive their like among previously recurring states. The operation of this law breaks up the order of representation of states as they have actually occurred in the past by the introduction of new forces whose action accomplishes a selection according to likenesses.

§ 24. This representation of like experiences of past consciousness is affected by differences in quantity and quality of the impinging forces. We noted that the quantity of sensation determined the attention to presentative states (§ 6). If the attention is engrossed with presentative experiences, there is less opportunity for the movements of representation. The automatic activities are held fixed upon the presentative objects to which they are directed. The effect of strong sensational impression is to abate, so long as it may last, the representative activities. The prevalence of disturbing influences about us always interferes with the operation of reflection. If we wish to pursue a train of thought we close our eyes and shut out as much as possible the impressions of the senses. This same law holds true with respect to particular impressions. A strong sensation of colour tends to exclude representation of any other colour; a loud sound prevents us from representing any other sound; a bitter taste forbids us from thinking of a sweet taste while the strength of the former remains. This rule, however, is subject to the qualification that a painful sensation, after its first impact, tends to recall the pleasurable experiences of relief from pain. Such a qualification is not really any exception to the rule; for the reason that the *first* effect of painful sensation is always to detain the attention, *then* to stimulate movement; then, if the pain-producing cause continues to operate, to abate all movement. If the sensation is strong, there-

fore, it excludes for the moment everything else; it then, afterwards, sets in motion activities for relief resulting in a representation of the means of relief. If the cause of pain, however, is still present, the attention is recalled to the painful sensation over and over again, thus illustrating the principle of engrossment which we have just been considering. These quantitative effects are produced by a volume of stimulus, by acuteness of the impinging force, and also by its continuance.

§ 25. Impressions which affect consciousness as feeling are very much less revivable than those which generate cognition. And of cognitive experiences those which are the most definite are the most readily revived. It hence follows that sensations of the special senses are more easily and more readily represented than the systemic sensations. And of the special sense impressions, those of sight and hearing are greatly superior in point of recoverability to those of taste and smell. The definite sensations of touch, attained by the finger-ends, for instance, are much more subject to representations than the indefinite sensations of touch or pressure upon parts less endowed with sensibility. With the organic sensations we have the lowest degree of revivability. It is almost impossible to represent hunger or thirst unless we are actually hungry or thirsty; on the other hand, when we are in a state of inanition we cannot represent repletion. This is also an illustration of the law mentioned in the last section.

§ 26. The physiological environment in its varying conditions from time to time modifies the representative activity, as it does all mental states and operations. Generally speaking, health is favourable to greater activity, though there are some forms of disease in which activity of representation seems to be greatly stimulated. A well-nourished condition accelerates the movement of thought. This is another phase of the truth that wherever feeling predominates, cognition, and with it representation, is less active. When a person is sick and when he is tired he is less able to perform mental operations which call out the automatic activities. It is probable that any condition which supplies the brain with an abundance of blood quickens and promotes mental action, which effect is still more marked, prominent and certain if the blood supplied is of good quality. The stagnation of circulation and general decline of the bodily functions which characterise old age, are very notably accompanied by a deteriora-

tion of representative powers, of which failure of memory is the most salient example.

§ 27. The frequency of repetition of impressions has a tendency to make those impressions more revivable. Every additional repetition works to perpetuate and establish that modification of the structure which renders a representation of the experience more certain and more ready to be evoked. Repetition produces the same effect as an equivalent quantity of sensation in the first impact, subject to the influences of agencies intervening between the successive impressions; its relation, then, to the representative power as a force of the environment is a quantitative one.

§ 28. Recency of impression often renders a state of consciousness more revivable. We remember best that which we have most recently experienced, unless, however, there are counteracting causes. These causes are the factors we have been considering which relate to quantity of sensation, and some others respecting quality which we have not dwelt upon. A strong impression, or one made more strong by repetition, will be revived more readily, even though more remote in time, than a weak impression which is comparatively recent. The influence of the physiological environment in counteracting recency is very conspicuous. We remember impressions made in early youth even to our dying day, when recent impressions are entirely obliterated. In fact, recency is at the most only a subordinate influence affecting representation.

§ 29. Many of the agencies to which we have adverted as affecting representation, and which we have ascribed to environment, are themselves determined by heredity. Particularly is this the case with all those forces which we have classed with the physiological environment. The individual constitution, with its inherited tendencies and predispositions, is continually modifying the current of representations. The manner in which it does so has already been indicated in our review of Organised Inheritances in Chapter XXX.

§ 30. In addition to the effects wrought upon representation by environment and heredity, its whole course is powerfully modified by the volitional activities in the exercise of their selective functions. Automatic activity moves towards pleasure, and away from pain. The application of this principle to representation gives us its result in the truth that we retain in experience, conserve, and represent that which is most interesting to us. Let us first

notice the operation of this law in controlling the continuance of present impressions. If a certain presentative state is pleasurable, we have already observed that it detains and satisfies the attention. Opportunity is hence afforded for the impinging force giving rise to the sensation to make a stronger impression upon the mind. If this force abates, still the representative excitement accompanying the presentation is fostered and increased by the inhibition of other movements which is accomplished by the pleasurable feeling. By representation, and association acting with it, the mind holds on to the experience as long as possible. Likewise, if a part of the experience is pleasurable, the representative activity represents the pleasurable parts of the experience, and aims to continue their presence as long as possible. If, however, a painful impression is made, we have in another place considered how a movement is at once initiated to expel from consciousness this pain. Instead of the representative power operating to represent the painful, we saw that it reproduces the movements which former experiences have shown to secure relief and the state of relief itself. So that in the proportion that the impinging force creates pain, the representative activity develops the counteracting pleasurable states of previous experience. And whenever any painful state arises, the automatic activity exerting itself to get rid of the pain tends to inhibit the representation of painful states and to introduce into consciousness pleasurable representations, especially those definitely connected with the removal of and relief from pain. Thus the automatic activity, directed and impelled by pleasure and pain, moves ever toward reproducing the assimilable and toward keeping down and expelling that which is not assimilable.

§ 31. Not only does the self-activity of mind affect representative states directly in the manner just stated, but it affects them mediately through the modifying influence of efferent movements upon presentative states. The organism reacts upon the environment, alters it, and contributes to form a new environment. Hence arises a different set of presentative experiences to furnish again material for representation. These efferent movements follow the law of attraction to pleasure and repulsion from pain. They are either organised in the system from the beginning, are voluntary, or have through repetition become organised in the individual experience so as to be performed promptly and inevitably. The great complexity of these movements has been the subject of our notice in more than one place.

§ 32. The foregoing statement of the chief characteristics of representative experience emphasises the fact which has been patent from the beginning of our study, that representation is distinctively a phenomenon of the cognitive aspect of states of consciousness. Feeling may be reproduced, but it must be *known* to be reproduced; so also with volition; we speak of representative feelings and reproduced volitions, meaning that we *cognise* them as represented and reproduced; they are the feelings and volitions accompanying representative cognitions.

§ 33. Let us not fail to remark the intimate connection of representation with association and attention. The automatic activity, as attention, holds an object in consciousness; but we have seen that representation is essential to any continuance; besides, in order to retain a state of consciousness we must be conscious of its agreements, thus requiring association; and yet we can become conscious of no sameness without change. Again, there can be no representation without something represented; and whatever is represented is something to which the mind attends, and which is identified as a whole whose parts at least have been matter of previous experience.

Finally, the general inefficacy of associations for mental operation without representation has recently been commented upon in our exposition of the former process. It appears, then, that these three forms of automatic activity are mutually necessary to each other, and, indeed, to all consciousness.

EFFERENT ACTIVITIES.

§ 34. Not only does conscious automatic activity work in attention to present states, in association of states both presentative and representative, and in representation of past experiences; it also expends itself in efferent movements which accomplish reactions of the organism upon the environment. To this circumstance I called attention in § 31; and the general laws of the exercise of these activities were outlined in our exposition of the genesis of volitions. The different classes of efferent activities were set forth in that place (Chap. XXVIII.). We there saw that movements follow the law of pleasure and pain, pleasure being connected with increased vitality and the progress of evolution and integration; while pain is an index of depressed vitality, dissolution and disintegration. We also saw that movements and sets of

movements in conformity with this law become organised in the system and obey certain stimuli without conscious choice: while other movements take place more slowly and less uniformly, under the direction of conscious motives more or less conflicting with each other, thus giving rise to all grades of voluntary determination. What has been said on these subjects need not be repeated. Hence there is no occasion to do more at present than merely to cite the efferent movements as exhibiting one class of the conscious automatic activities which are constituted factors in the development of states of consciousness.

REDINTEGRATION.

§ 35. It is evident that we need some more general expression for the process of development of states of consciousness so far as affected by automatic activity. This activity has usually been called association; but it is more than association. The development is the result of all the agencies we have mentioned in this chapter, and it is difficult to see how they can be comprised under the head of association, since we must have something brought and held before the mind in order that the associating power may operate. Objects are presented and integrated with other presentations and with representations; these integrations are again represented and again integrated with new objects. The development of states of consciousness is a process of alternate differentiation and integration, combination and recombination, change and consolidation, to a high degree of complexity.

§ 36. This process has been named Redintegration. The name is somewhat objectionable, as tending to leave out of notice or to obscure the differentiating element; but inasmuch as redintegration means repeated and renewed integration which can only be accomplished by change, it necessarily implies differentiation; and after all said it is the integrating process which gives us those *states* of which consciousness is made up. Hence upon the whole it seems desirable to retain the name we are considering to characterise the process of automatic development, combining the subordinate and mutually complementary processes of attention, association, and representation. We may, therefore, sum up the conscious automatic activities under the heads of Redintegration and Efferent Activity.

§ 37. It remains for us, from the data already given, to formulate the laws of redintegration. We shall then be prepared for

a particular examination of the process of development of states of consciousness. But before attempting either there is something more to be said respecting the factors of development.

CHAPTER XXXIII.

UNCONSCIOUS ACTIVITIES.

§ 1. WE now approach some of the most curious facts with which the science of mind has to deal. We are again brought up to the questions of the connection of mind and matter, and of the substance of both—questions which we feel must be answered in order to give any consistency to science, but which it does not seem possible to answer. After having assumed to make out a science of mind by dealing with states of consciousness, we are aware that the latter are controlled more or less by sub-conscious or unconscious processes of precisely the same kind (so various circumstances incline us to infer) as those which work out conscious redintegration. How to class these processes is the problem. Are we to regard them as physical? If so, what is their relation to mind and consciousness? Are we to consider them as mental? If so, what becomes of our science of states of consciousness?

§ 2. Under the title of this chapter I include both reflex and automatic activities. As a rule, there is in unconscious action a mixture of the two; and perhaps some day, when we know more of nervous functions, we shall find that many of the actions we are accustomed to regard as automatic are themselves properly reflex. At present, however, it is difficult for us to determine what the nervous changes are which accompany consciousness, and still more difficult to ascertain those which take place underneath consciousness and in the intervals of unconsciousness. But that there are such changes as the last-named is as certain as that there are changes accompanying conscious states; and it is equally certain that the unconscious changes modify the development of states of consciousness.

§ 3. If the reader will take the trouble to turn back to Chapters XXIII. and XXIV. (in Part IV.) he will have before him for use in the present connection a grouping of reflex and automatic actions in relation to consciousness. In those chapters and the next one,

as well as in the former chapters relating to the nervous system of man and the lower animals, we brought out the fact that there exists in animal organisms some degree of reflex and automatic action before there is any development of consciousness at all, this being true both of the animal kingdom in general and of each individual in the earliest stage of existence. We also saw that, after consciousness has supervened and been destroyed by excision or disease of nerve-centres, still very complex movements will take place, chiefly through reflex and to some degree through automatic action. All these actions are efferent; at least the efferent movements are all we can take account of, for, since there is no consciousness as yet in the one case, and in the other consciousness is obliterated, not to return to the same individual; we cannot connect any central action which there may be with conscious states. And whatever effect these movements prior to the birth of consciousness may have ultimately upon such conscious states, it is clearly an influence to be considered under the heads of environment and heredity.

§ 4. But the grouping just referred to gives us, both as to reflex and automatic movements, two classes of actions, of which some further account must be taken. They are the second and fourth of each classification, including actions which take place during suspended or interrupted consciousness, and those which occur together with consciousness, but either outside the sphere of consciousness or when the whole attention is elsewhere concentrated.

§ 5. The first of these classes includes the phenomena of dreams, sleep-talking, somnambulism, anæsthesia, and hypnotism also, for the latter is consciousness interrupted, and at least partially suspended; it likewise embraces the unconscious cerebration that takes place during those states. The second class includes the remaining phenomena usually covered by the term unconscious cerebration.

§ 6. Phenomena of the first class exhibit states of irregular abnormal consciousness, in which the influence of some one or more of the factors usually present and influencing states of consciousness is temporarily removed. Usually the avenues of epi-peripheral sensation, or some of them, are closed, and the ordinary influences coming from this source are annulled. In dreams the representative activity is at work with attention and association, but the modifying effects of external environment are

absent, or mainly so. In somnambulism, which is generally understood as inclusive of sleep-talking, we appear to have the representative processes in operation, and some one or more of the epi-peripheral sensational inlets open, together with a far larger degree of efferent activity than in simple dreaming. In the waking state, however, we do not ordinarily remember our conscious states while in the somnambulistic condition; but it is common enough to remember our dreams, though on the other hand, it is quite certain we do not remember all, or even the greater portion of them. In the case of persons under the influence of anæsthetics, there is a partial suppression of consciousness, which may be increased to a total suppression. Hypnotism is really an artificially-induced somnambulism. We shall recur to all of these conditions under the head of abnormal consciousness.

§ 7. In all these states, as well as in normal consciousness, there are activities of the nervous system at work which are wholly outside of consciousness, but which give their results to consciousness. Dr. W. B. Carpenter, in a work of much value,[1] has presented ample illustration of this fact, and confirms his own observation by those of many others. These observations are susceptible of verification by any one. Of course the operation of unconscious agencies is a matter of inference. We are aware that certain changes have taken place in the relations of conscious states to each other, which we cannot explain by the normal operation of conscious activities, nor by the other causes usually determining states of consciousness. (1) One of the most familiar instances is the sudden recall of some mental object which we have been vainly seeking to remember, after we have for a time wholly abandoned the attempt by turning our attention to something else, or after we have awakened from a profound undisturbed sleep. We appear to set agoing by volition a train of representations and associations which work on after we have withdrawn all attention from it, and after we have ceased to be conscious of it, and finally result in causing the desired object to reappear in consciousness. (2) The writing out of thoughts, of which the mind is not conscious as then present by panchette, furnishes another example of unconscious cerebration; muscular movements are made to express ideas which have passed out of consciousness. (3) In reasoning, conclusions are often

[1] *Mental Physiology.*

reached after active conscious ratiocination has been tried and abandoned. Every one can recall periods of his own experience when, after intense thought upon a subject with the purpose of arriving at some conclusion from data given, the mind is so perplexed as to be wholly unable to arrive at any conclusion whatever. If, then, conscious effort is stopped, the mind seems to settle itself, and at length a clear, consistent and satisfactory conclusion will emerge into consciousness. Dr. Carpenter quotes the following in regard to Mr. Appold, the inventor of the centrifugal pump, which attracted attention in the International Exhibition of 1851:—'It was his habit, when a difficulty arose, carefully to consider the exact result he required; and having satisfied himself upon that point, he would direct his attention to the simplest mode in which the end could be attained. With that view he would during the day bring together in his mind all the facts and principles relating to the case; and the solution of the problem usually occurred to him in the early morning after sleep. If the matter was difficult, he would be restless and uneasy during the night; but after repose, when the brain had recovered from fatigue and when in the quiet of the early morning no external influences distracted his attention, the resultant of all known scientific principles bearing upon the question presented itself to his mind.'[1] (4) Not less conspicuously inventive and constructive power seems indebted to unconscious processes for its creations. Dr. Carpenter instances under this head the discovery of the method of quaternions, and also of Mr. F. H. Wenham's improvement in the binocular microscope. He quotes also the following account of Charlotte Bronte by Mrs. Gaskell: 'She said that it was not every day that she could write. Sometimes weeks or even months elapsed before she felt that she had anything to add to that portion of her story which was already written. Then, some morning she would waken up and the progress of her tale lay clear and bright before her in distinct division, its incidents and consequent thoughts being at such times more present to her mind than her actual life itself.' If I may be pardoned for referring to my own experience in this connection, I may say that again and again in the progress of this work I have turned my thoughts to the method of treatment of a topic without being able to satisfy myself as to how to arrange what knowledge I may have had upon the subject, and have had to wait for days,

[1] *Proceedings of the Royal Society*, Vol. XV. p. 5.

and once or twice for weeks, until I experienced a 'clearing-up,' after which I have been able to take my pen and write fluently and unhesitatingly the deliverances of my mind. I have best accomplished the *éclaircissement* by diverting myself in some way, sometimes by walking in the crowded street of the city, sometimes by reading books, leading the mind as far away as possible from psychology, and sometimes by attending a theatrical or musical performance. I have had at such times a sense of the uselessness of any voluntary effort to deal with the topic upon which I was hesitating, and also a feeling that the matter was working itself clear in my mind. Finally on a sudden, usually in the morning after coffee, I would feel a readiness to write, a thought would occur to me which would give me the key to the situation, and directly I would find my trouble at an end and the whole course of my exposition laid out before me with perfect distinctness. It has many times seemed to me that I was really a passive instrument in the hands of some power not myself, which was working up thoughts for me independently of my own will. Perhaps such experiences as these, with their proper scientific explanation, account for the apparently mysterious deliverances which the ignorant are prone to consider as revelations from supernatural sources. Let me add also that, in view of the necessity frequently arising of having to wait for the results of unconscious processes, I have formed the habit of anticipating; of getting together material in my mind for the treatment of a subject some distance ahead in my work, and leaving the mass to digest itself until I reach the point where I must commit to paper whatever I have to say on that subject. I delayed for a month those portions of this part relating to attention, association, and representation, before I made out to my own satisfaction what each process was and what were its relations to the others. I went into my library in the morning, when I usually devote an hour to writing, and for several days in succession read Aristotle, Locke, Hartley, Hamilton, Mill, Bain, Spencer, Lewes, Taine, Hodgson, and some articles in 'Mind;' I then would simply sit looking out of the window at the people passing on the street and in the park in front. I was conscious of thinking of nothing in particular, though I had often a sense of annoyance because psychological thought would not flow. I would take my field-glasses and watch people and things. I was ready to write and desired to write, but simply could not because repelled from

doing so by the consciousness that I was not yet in proper mental condition to say what ought to be said. On reaching my office and attending to my daily business the whole subject and all related subjects would be dismissed from my mind, though not on the way to the office. On returning home, after dinner my mind reverted to the undetermined questions with an increased sense of annoyance at the delay, but still with an inability to do anything to help the matter. Frequently I devoted myself to looking out of the window. Finally, I gave up thoughts of Mill, Bain and Hamilton, and devoted myself to reading Balzac and Brantome. In the mornings again, so far as I was conscious of thought on psychological subjects, I devoted myself to planning how I should arrange Part VI. of this work and what I should say therein, what the divisions of the chapters should be, and what special points should be made the subject of consideration. Every now and then I would revert to attention, association and representation, to see if anything suggested itself to me. One evening when I was reading the daily newspaper the substance of that which I have said herein on those subjects flashed upon my brain, my judgment approved the result, I mentally exclaimed Eureka, and the next morning went to my library and began to write, with no more hesitation than is usual to me in carefully considering what I write as I go on. I had no more doubt about the main heads of the exposition, and any longer delay was only the delay incidental to perfecting the execution as far as I was able to do so. This is but a sample of many such experiences; perhaps it will be more interesting to the reader than to repeat the well-known instances of similar experiences, which are already on record.

§ 8. Efferent activity is unconscious save in its initiation and in its results reported by afferent nerves; but much of such activity is wholly unconscious. The most of the ento-peripheral physiological processes are carried on without conscious recognition, though of course they give rise to and modify feeling. Very many epi-peripheral movements are unconscious. The expressions of the feelings in the face and in the muscles in other parts of the body are frequently unconscious, and all sorts of movements which the body is educated to perform involuntarily and spontaneously are apt to be performed unconsciously also when the attention is diverted to something else. In addition, we must consider likewise the reflex and automatic movements which are

organised in the system and which we have spoken of as below and prior to consciousness in the scale of development of animal life.

§ 9. In the growth, the accumulations, the elevation and depression of feelings of all sorts, unconscious influences are plainly at work. Dr. Carpenter instances the growth of sexual love as proceeding for a long time without the parties suspecting it, either as to themselves individually or as to each other. Illustration of the same fact may be found in all the passions and sentiments. The leading sentiments which make up the character of an individual are slow growths whose definite progress we cannot trace, and of the existence of which we are often unaware until some occasion develops them in a manner and with a strength quite surprising to ourselves. In the department of feeling we find the borderland between consciousness and unconsciousness. Definite consciousness is all the time sinking into indefinite consciousness and thence disappearing into unconsciousness, while feeling also is continually rising out of unconsciousness and thence passing into a greater or less definiteness of cognition.

§ 10. Without multiplying particular examples, it is apparent from the circumstances under which consciousness is generated that unconscious cerebration goes on and brings new effects into consciousness. We found in preceding chapters that consciousness arises upon an action and reaction of nervous forces. We saw that not only must there be a current of nervous motion resisted, but there must be a certain degree of motion and resistance, a certain amount of force brought to bear before consciousness comes into being. We also noted the peculiar sensibility of nerve-matter to stimulation, and with it a readiness to propagate within its structure motions once communicated to it. We thus learned that there are nervous movements all the time going on during life, which nevertheless do not develop a sufficient quantity of motion and resistance to give birth to a state of consciousness. These movements run to and from, between and within the centres. We also noted that as nervous movements in and through the central system become more direct, prompt and unhesitating along definite lines, consciousness is excluded, and reflex and automatic action without consciousness is all we find. Furthermore, we ascertained that nervous movements of all sorts leave the structure in a condition more or less modified, notably in rendering the structure more susceptible to a revival of the

movements once experienced, and doubtless in other ways not so prominently noticed. Therefore, the organism presents a nervous structure continually agitated by impressing forces and continually modified by them and by their reactions. In the midst of these movements an increased development of the same kind of force gives movements and resistances attended by consciousness. These movements with consciousness may be the culmination of movements without consciousness, or they may end in inferior movements without consciousness; they propagate other and more diffused movements which are yet not strong enough to give rise to consciousness. Now the persistence of force itself necessitates that these actions and reactions below consciousness aggregate or diminish the conscious movements as they coalesce with them or draw force from them, and also as they modify the structure render particular conscious movements more easy or more difficult of recurrence. Attention may be directed to a certain set of impressions; the associating and representative activities are set at work in a series of redintegrations. The attention is diverted to some new impression; the nerve force is drawn off from the course of redintegration once begun, but the movements thus inaugurated continue, though with a diminished quantity of force; redintegration proceeds below consciousness; until by-and-by something draws back the attention to the first series of states, and instead of reproducing the redintegration where consciousness left it, the last term of the series of unconscious redintegrations emerges into consciousness, and we are made aware that unconscious processes have been working along the same line of redintegrations which our consciousness left when drawn away by a greater attractive force, and that we are obtaining the result of those processes in the present state of consciousness.

§ 11. Not only does it appear that unconscious redintegration is liable to occur in the midst of conscious life, but it is evident, if our statements as to the genesis of states of consciousness are correct, that it must be occurring all the while, and that conscious redintegration must be relatively inconsiderable as compared with unconscious redintegration. By this I mean to say that in the life of the individual the amount of unconscious nervous molecular motion is far in excess of the amount of such conscious motion. Unconscious redintegration goes on during sleep in many directions; it goes on also when the attention is fixed upon some conscious experience; it is fed, nourished, and modified by a multi-

tude of various and varying impressions. To the work of redintegration should be added all the unconscious efferent movements of which I have spoken. So that, in fine, in the language of Dr. Bastian, 'those nerve-actions attended by conscious states . . . . constitute in reality only a small fraction of the sum total of nervous states or actions which are now known to be comprised among (*a*) the initial nervous phenomena leading to sensation and emotion, among (*b*) the intermediate links of thought and imagination, among (*c*) the beginnings of desire, and which exist (*d*) as the incitations to or accompaniments of volitional action.'[1]

§ 12. We may regard it as plainly demonstrated that there are nervous motions with all consciousness, and that there are nervous motions without any consciousness at all. And so far as we are able to collect evidence, the difference between the two is one of relative quantity of force and not quality. We are justified in asserting that at least there is a correlative and corresponding variation of states of consciousness and nervous motion and states. It is then easy to see how an increment or decrement of conscious nervous motion may be affected by unconscious nervous action, and hence a change may be wrought in a conscious state by unconscious activity; likewise it is plain that modifications of the structure wrought by unconscious movements will have their effect in subsequent conscious states. It is but a step farther, which we may take without any inferential hindrance, to maintain the proposition that the unconscious redintegration of nervous states through nervous motions is a producing and modifying factor of conscious states in all degrees of redintegration. The degree of modification will be in proportion to the quantity of force employed in the unconscious movements, and to the complexity of the actions and reactions which take place in those movements, subject also to the influence of all the other factors we have instanced.

§ 13. If then we admit unconscious activity as a factor of the development of states of consciousness, there remains the question whether these unconscious efferent and redintegrating activities are to be regarded as mental or physical. It is plain to me that they must be regarded as physical, so far as we know anything about them outside of consciousness. We know only that certain nervous movements occur without consciousness which propagate or modify other nervous movements which are attended by consciousness. On the one hand, we have conscious states; on the

[1] *The Brain as the Organ of Mind*, Chap. X.

other nervous motions, both with consciousness and without. To say that nervous movements are mind or mental activities contradicts the fundamental postulate of all knowledge—the antithesis of Ego and Non-Ego,—and is a proposition without meaning. There is no power of thought to transform a nervous movement into a state of consciousness; and if we take away the latter, all that is left is a nervous movement, which can be explained fully by a reference to the laws of matter.

§ 14. There is no greater difficulty in understanding how a state of consciousness such as we call redintegrated may be produced by a succession of unconscious redintegrations of nerve force, than it is to comprehend how a sensation arises from physical impact. The latter is an epi-peripheral force, while the unconscious nerve-motions are simply the ento-peripheral and central forces In the case of unconscious redintegration force is generated, and operates nearer to the centres than in the case of sensation. How any nervous movements give birth to a state of consciousness is a mystery; but that a series of these movements operating under the laws of organic life in and among the centres of stored-up nerve-force should develop and modify conscious states is no more a mystery than that similar results should follow the application of a series of impacts upon afferent nerves at the periphery.

§ 15. But while all we know about unconscious redintegration is of movements of attraction and repulsion, assimilation and dis-assimilation, of molecules of nervous matter which finally develop modified conscious states, we are not authorised to affirm that these unconscious nervous actions and reactions are not attended with some form of mental existence. We can only assert that we have no experience or knowledge of mind except as states of consciousness; but we are nevertheless obliged to postulate a subject Ego as a substance for states of consciousness, an unknowable reality underlying all conscious states. That there is unconscious mind, therefore, we are forced to assume at the very threshold of mental science. But we can have no science of unconscious mind, and we can only think of it in terms of consciousness. We can picture to ourselves symbolically trains of conscious state moving on while we are unconscious of them; but this, it scarcely need be said, is rendering the unconscious into the conscious, and still postulating an unknown subject mind beyond.

§ 16. The conclusion of the whole matter, consequently, is this. We know conscious states, and we know molecular nervous motions

and nervous states. All the latter, whether attended with consciousness or not, are alike biological and affect conscious states as material forces. We neither know nor are able to think of any mental states except in terms of consciousness; but consciousness itself inevitably postulates an unknowable subject mind below consciousness, and upon which it rests. We can have no knowledge (and hence no science) of unconscious mental states. It therefore remains true that we must group together nervous phenomena of all sorts among the sciences of matter, and set over against them all, as a distinctively mental science, the science of states of consciousness.

CHAPTER XXXIV.

THE ULTIMATE FACTORS.

§ 1. IN the four immediately preceding chapters, we have gathered together the factors of the development of states of consciousness into four groups, namely Organised Inheritances, Environment, Conscious Automatic Activity, and Unconscious Activities. The first group includes the influences coming from an inherited structure with corresponding predispositions as regards function; the second group embraces the modifying influences, both of the progress of the individual's organic life, and of all the impinging agencies of the general order of nature; the third and fourth take in the reactions of the organism in the physiological environment and the self-activities of mind. Our task now is to ascertain if these groupings express ultimate or prime factors, and if not what further reduction can be made.

§ 2. Assuredly they are not the ultimate factors; for already we have noticed a close connection between the last group of the four and the third, and the first class embraces only transmitted structures and tendencies which have been previously organised. Moreover the question arises, if we are entitled to refer unconscious activities to material forces, including as they do automatic activities also, why should we not refer all automatic nervous movements which are attended with consciousness to material forces as well and group them under the head of environment?

§ 3. Organised inheritances affect only the development of

states of consciousness in the individual; they are not ultimate factors of the development of consciousness in general. They furnish an organised structure which, so far as it contains capacities for mental states, has those capacities by reason of the preservation of the results in former individuals of the same processes which develop states of consciousness in the successor. Heredity gives an organised physical structure and capacities for mental experiences.

§ 4. Under the head of environment we do not ordinarily include the nervous structure in the exercise of its normal functions of transmitting, conserving, and originating the force which, under certain conditions of exercise, is attended with consciousness. It is the source of the biological self-activity of the organism, and though the structure with its functional powers be built up from the physiological environment, it reacts upon and modifies this environment.

§ 5. These centres of force organised in the nervous structure both resist the action of environing forces and initiate new movements in, upon, and against the environment. This is automatic activity, both conscious and unconscious. In the midst of these actions and reactions of the environment and the organism consciousness has its genesis, and conscious states proceed in their course of development.

§ 6. The ultimate factors we are seeking would then seem to be Environment and Automatic Activity, in all their modes and varieties of operation. These we found to be the ultimate factors of the genesis of consciousness in general (Chaps. XXV. and XXIX.), and they are also the ultimate factors of the development of particular states.

§ 7. But after all we have in these two only the factors of nervous states and movements; and the difficulty suggested above near the end of § 2 has not yet been met. Why is not automatic activity to be included with other forces within an environment of mind? The answer to this question is, I take it, that mind has no environment except mind. Each class of forces we have been examining has its exact parallel and correspondence in mental powers. There is heredity of mental capacities and predisposition to mental activity; there are environing mental powers corresponding to the environing physical forces of which consciousness takes account; there are automatic mental activities reacting upon the mental environment. Each state of consciousness has a mental side and

a complementary physical side. Whatever is attributed to the physical has its copy, like but different, attributed to the mental. Physical forces exhaust themselves in the physical universe; mental powers do their work, and have their actions and reactions in the universe of mind. Side by side go these two mutually necessary and yet mutually exclusive classes of activities. But the nature of their connection is still a mysterious problem, not yet solved.

§ 8. I am obliged again to run the risk of the reader's displeasure by suggesting the question which I decline fully to discuss. I refer to the question of the connection of mind and body. I shall once more postpone such a discussion, because I wish to reserve it for the latter part of this work, deeming that we can intelligently consider the problem only after we have gone over the whole field of mental phenomena. As before said, it is the final question of psychology.

§ 9. Whatever views we entertain as to this connection of matter and mind, one thing is certain, that we are obliged to express our knowledge of mind in terms of matter. From this necessity we are all the time, logically speaking, in confusion and contradiction. We speak of material forces as factors of the development of states of consciousness, as if they were causes of consciousness, and again refer to conscious activities as causes in the world of material things; but we know not whether we can properly affirm a relation of cause and effect between the two. So, as regards the relations of states of consciousness to each other, we state them in terms of matter and motion, while positing an exclusion from matter and motion. While the facts with which we have to deal entail these contradictions and we cannot become wholly freed from them, it is advisable now and then to rectify our position by recalling our minds to the fundamental antithesis of Ego and Non-Ego, which is the first postulate of knowledge. In the light of this postulate and of the facts we have found in our examination thus far, it appears that all we can affirm of the relations of nervous movements to states of consciousness is a coexistence and correspondence; in other words, that the state of consciousness is the concomitant of the nervous motion. Strictly speaking, then, we are in error when we say, for instance, that environment causes a certain state of consciousness. We mean that environment causes certain nervous motions which are attended with a certain state of consciousness; likewise, we should say that

automatic force causes nervous reactions which have their concomitant states and movements of consciousness. On the other side, thoughts, feelings, and volitions follow each other in causal relations, or at least sequence, according to laws, and these are accompanied by nervous movements. But though we thus speak, we cannot get rid of matter as an essential to the operation of mind. A state of consciousness postulates a material object-world, in which are uniformities of which consciousness takes account.

§ 10. From the foregoing considerations, it follows that we ought to exhibit the ultimate factors of the development of states of consciousness in some such way as below:—

The Unknowable Subject Non-Ego.	Environment, Automatic Activity.	—	Nerve-movements.	|	States of Consciousness.	—	Actions and Reactions of Mental Power.	The Unknowable Subject Ego.

It will be seen from this diagram that there is a double series of phenomena, or, if we prefer so to express it, a series with two inseparable faces: one nervous movements, the other states of consciousness. The environment and automatic activities produce certain movements of nerve-matter of such a nature that when they occur states of consciousness occur concomitantly with them. On the other side, the powers of mind in action and reaction produce states of consciousness.

§ 11. Since it is legitimately inferrible that every state of consciousness has an invariable concomitant nervous motion, and that as states change, so there go alongside corresponding and uniform changes in the nervous structure, it is probably advisable to allow an abridged statement of the facts, and continue to speak of mental states as caused by physical states. At any rate, it would be hard to abolish such usage of language. Similarly we shall have to sanction the affirmation that mental states modify physical states, since we have no means of getting at the ultimate physical changes; all we know of them is what we infer from mental changes. Until science gives us a better account than hitherto of the mutual relations of mind and matter, of the relations of states of consciousness to each other, of the dynamics of mind and of the mutual relations of material forces, the student of psychology will find in his way much that is provisional, uncertain, confused, and perplexing.

Part VI.

THE GENERAL DEVELOPMENT OF STATES OF CONSCIOUSNESS.

'The history of evolution is the real source of light in the investigation of organic bodies. It is applicable at every step, and all our ideas of the correlation of organic bodies will be swayed by our knowledge of the history of evolution.'—*Karl Ernst Baer.*

CHAPTER XXXV.

THE LAWS OF DEVELOPMENT.

§ 1. Under the term *Development* I mean to include the series of successions and co-existences of states of consciousness which make up conscious life from its beginning to the limit of our knowledge with respect to each individual; and also the relations of these successions and co-existences to each other and to unconscious things. Having given consciousness at the start, a history of the development of conscious states is a history of their successions and co-existences as related to each other.

§ 2. We have found the factors of this development, and reduced them to their lowest terms. It is now desirable to note the uniformities in the operation of these factors, to trace their course, and to exhibit the resultants of that action in conscious states.

§ 3. We have seen that each individual begins its life with inherited germs of development; that in him development proceeds according to certain laws; and that there are organised in the course of this development new germs as products which are transmitted to other individuals. In ascertaining the ultimate factors we found them to be the same for the individual and for consciousness in general, inheritance furnishing only an accumulated product of past actions and reactions. It is equally true that the laws of development are the same for the individual, for the race, and for all life wherewith we find consciousness. The differences between individuals of different degrees of development are differences in the products, not in the processes of development. These processes are the same in the lowest conscious life that they are in the most complex intelligence. Hence, if we interpret rightly the laws of the development of the individual consciousness, we have expressed correctly the laws of the development of consciousness in general.

§ 4. We have observed that there is a correspondence between

life and mind, indicated in the physical structure by an increased complexity of the nervous system in the higher development of life. Were there need, we might trace the correspondence of life and mind in detail. But this has been done by others,[1] and has already been illustrated sufficiently in this work. It, however, receives its fullest illustration in the fact that the most general and most universal law of the development of states of consciousness is no other than the law of evolution, which applies also to inorganic nature and to life. This law has been expressed in a previous chapter (Chap. XVII.); its enunciation, as applied to mental phenomena, is in similar terms:

GENERAL LAWS OF DEVELOPMENT.

§ 5. (1.) *Conscious existence is developed in correspondence with life in a series of progressive changes of states of consciousness, from the simple, the homogeneous, and the indefinite, to the complex, the heterogeneous, and definite.*

Apart from the observed correspondences of life and mind which objective psychology affords, introspective examination makes evident the truth of this law. The education of mind and the growth of mental acquirements furnish attestation. All the processes of mental action and the products of that action lend confirmation, down to the minutest details. Exemplification will be afforded in the succeeding chapters of the present work.

§ 6. Obviously this development has both a dynamic and a static aspect. There must be changes and things to be changed; states and changes of states. The general analysis of states of consciousness revealed as equally essential elements consciousness of agreement and consciousness of difference, duration, and succession. Hence the processes involved in development can be no other than the formation of aggregates and the dissipation or modification of those aggregates, that is to say, integration and differentiation. It is, therefore, true that the course of development of states of consciousness is a course of alternate integration and differentiation.

§ 7. But our consciousness of change is of things changed, of something succeeding something. We know the change by the presence of a coherent aggregate, different from some other or prior aggregate. Our science is a science of integrations and

[1] See Spencer's *Principles of Psychology*, Vol. I Part III.

changed integrations, of states and modified states. We know the differentiations only by the resultant integrations. Consequently the development of consciousness is a development of a series of integrations, aggregates, or states so related to each other as to show a progressive movement from simple, homogeneous, and indefinite states to complex, heterogeneous, and definite states.

§ 8. The environment makes its impressions, with which comes presentative knowledge; but we have learned that there is no continuity of consciousness, and, in fact, no consciousness at all without representation accompanying and connecting presentations. The representative powers conserve and reproduce; and representation is a continuous process. It follows that the development of states of consciousness in its course of differentiation and integration is a process of redintegration, that is to say, of integration, differentiation, new integration, differentiation, and further integration. The changed integrations and modified states are all representative states. The external environment furnishes new material for integration and modifies the course of integration, but the integrated and redintegrated states are representative. Therefore we may characterise the process of development of states of consciousness as a process of redintegration, and the special laws of that development will be the laws of redintegration. These laws will all be found to be subordinate to, and minor interpretations of, the general law of development given above, that is, the law of evolution as applied to mind.

§ 9. (2.) *Every conscious state is the result of the interactions, as modifying factors of development, of the environment, organised inheritances in the structure and the automatic activities In a word, every conscious state is determined by the action and reaction, past and present, of organism and environment.*

The first general law expresses the cause of development; the second is the law of the factors; a third will express the relations of states of consciousness to each other in their development.

§ 10. (3.) *Development of conscious states with reference to each other is a process of redintegration, as modified by environment, by heredity and by efferent activities.*

This is an expression of the course of development from automatic activity as a starting-point; for redintegration is itself automatic activity engaged in selecting and drawing in the assimilable, and avoiding and dropping out the non-assimilable. In

further explanation of redintegration the facts we have noted give us the following:

GENERAL LAW OF REDINTEGRATION.

§ 11. (4.) *Redintegration progresses and is accomplished, according to the general law of evolution, by the operation of the mutually complementary processes of attention which holds the experience and concentrates the automatic power upon it; of association which integrates the likenesses; and of representation which reproduces past states and parts of them for further integration.*

Subordinate to the foregoing we have various special laws of redintegration, of which we will take cognisance. It will be observed that they express what has been set forth before, and they will receive further illustration in subsequent chapters.

LAWS OF ATTENTION.

§ 12. (1.) *Redintegration begins in the exercise of automatic power as a reaction to afferent action, detaining the conscious state and excluding all others inconsistent with it. This process is attention, and its relations to consciousness are quantitative. The concentration of attention may be either upon a presentative, representative or mixed state; the unity of the state being determined by the congruity of its component parts.*

The above is a general law of attention, embracing definitions and a general expression of the character and effect of its operation. We next observe a law of the Direct Variation of attention.

§ 13. (2.) *Attention in presentative states varies directly as the quantity of sensation, extensive, intensive, or protensive; in representative states it varies directly as the degree of pleasurable interest, except as modified by a persistence of states occurring through the excitation of strong centrally-initiated feeling.*

The more complete the adjustment between the organism and environment, or in other words the more accustomed the organism is to particular impressions, the less the quantity of feeling aroused, and hence the less degree of attention. Similarly, the more accustomed the mind is to particular representative states the less detention there is upon them, the tendency being in that case toward a lapse to unconscious redintegration. This is a

scholium upon the operation of the above law which it is desirable to note here because of its important bearings upon development, though of course it relates primarily to the causes of the production of feeling.[1]

Reference has already been made to the persistence of ideas,[2] and it will receive further elucidation in another chapter.

The third law of attention which we shall write down is the law of Inverse Variation of presentative and representative attention.

§ 14. (3.) *Presentative and representative attention vary inversely. Attention to representative states is counteracted by the presence of sensations concentrating a superior degree of automatic power. On the other hand, attention to presentative states is diverted when a greater amount of automatic power is concentrated upon the representative object.*

There is a continuous mutual action and reaction of organism and environment. The action of the environment produces involuntary attention, and through the inward concentrations of attention upon representative states the development of voluntary actions takes place with their modifying influences upon the environment.

We now pass to the

LAW OF ASSOCIATION.

§ 15. *In all consciousness there is a continuous integration wrought by the association of contiguous similarities in experience, the completeness of the integration varying according to the degree of homogeneity and the propinquity of the objects associated.*[3]

Exposition of this law beyond that already given in treating of association as a factor of development, I shall reserve for subsequent chapters.

LAWS OF REPRESENTATION.

§ 16. (1.) *Every state of consciousness fixed by attention is maintained in its duration, and may be restored in greater or less degree of vividness, through a representation of its integrations in their original relations of co-existence and sequence inter sese and to other states.*

[1] See Chap. XXVI. Sec. 101. [2] See Chap. XXXII. Sec. 2 ff.
[3] See Chap. XXXII. Sec. 10.

Consciousness itself being dependent upon representation, every conscious state exhibits from moment to moment of its continuance a representation of its past moments in their original relation of co-existence and sequence. Likewise after it has passed away it may be restored, in some degree at least. This law exhibits the fundamental fact of representation, namely, a reproduction, reiteration, repetition of an experience once had.

§ 17. (2.) *Every state of consciousness tends to revive, and recall into contiguity with it, some of its likes among previous states, with their associations.*

The facts of nervous action which explain the circumstances of the revival of similar impressions have been given in our study of the relations of the nervous system to consciousness, and are summed up in Chap. XXXII. § 23.

These two formulas give a law of the continuance of an experience through representation and a law of the reproduction of experiences. We observe the operation of representation to exhibit a tendency to perpetuate those states held by attention, and to revive some of the previous states. We need then to ascertain what states in the past experience are more apt to be represented.

§ 18. (3.) *Those states are most apt to be revived upon which in past experience the greatest amount of attention has been concentrated.*

Hence—

a. Pleasurable states are more prone to recur, and integrations formed during pleasurable states.

b. Habitual states and associations are more apt to recur in proportion to the amount of previous repetition. Of these there are three sub-classes, namely—

1. States organised by inheritance.
2. States determined by repetition of environing impacts.
3. The most definite and most highly integrated states.

§ 19. (4.) *Sometimes recency of an experience renders it more readily revivable.*

§ 20. The laws of unconscious redintegration are in no wise different from those of conscious redintegration, except that they must be expressed in terms of nervous motion and not terms of

conscious action. The laws of environment are the laws of material nature inorganic and organic. Heredity presents only the accumulated force of previous organisation through action and reaction of organism and environment. Therefore we may conclude our summary statement of the laws of development with the

LAWS OF EFFERENT ACTIVITY.

§ 21. (1.) *Efferent action tends to conserve and increase pleasure and to eliminate and avoid pain.*

This is the law of voluntary action; closely connected with it is the law of organised action.

§ 22. (2.) *By repetition actions performed according to the law of pleasure and pain are combined and organised into habits of action, which uniformly follow their appropriate stimuli.*

§ 23. Having now examined and set forth the factors and the laws of development, we are prepared to trace the course of development in both its dynamic and static aspects, and therein we shall find illustration and demonstration of the truth of these statements of uniformities among mental phenomena.

CHAPTER XXXVI.

KNOWLEDGE AND BELIEF.

§ 1. THE development of states of consciousness on their cognitive side exhibits a distinction or apparent distinction made by the mind between *knowing* and *believing*; a distinction so pervasive as to affect all cognition. It is quite essential, therefore, to settle, if possible, the relations of knowledge and belief. In such an attempt we shall review a considerable portion of what we learned in our general analysis of states of consciousness, as well as some of the facts and conclusions we have already reached in other parts of this work. Such a review will be of service, not only for the purpose of ascertaining the true psychological nature of belief, but also in connecting more closely the earlier with the later portions of our treatise.

§ 2. Belief seems to remain still among the few mental phenomena, whose place and connections are not determined with a degree of positiveness and certainty sufficient to make students of mental science feel very sure of their ground. James Mill, with his accustomed clearness of exposition, enumerated in his 'Analysis of the Human Mind' the kinds and objects of belief, reducing all cases to indissoluble association, and maintaining 'that there is no generic distinction but only a difference in the strength of the association between a case of belief and a case of mere imagination; that to believe a succession or co-existence between two facts is only to have the ideas of the two facts so strongly and closely associated that we cannot help having the one idea when we have the other.' Upon this exposition by James Mill has taken place perhaps the most instructive and valuable discussion of the subject of belief which is extant. This discussion occurs in notes by Professor Bain and John Stuart Mill, in the edition of the 'Analysis', published in 1869 (Vol. I. p. 393 ff.). Professor Bain, in his 'Emotions and Wills' (p. 505 ff., 3rd ed.), has gone into the matter more thoroughly and with greater amplitude of detail, but discloses little not contained essentially in his notes to which allusion has just been made. These latter have the advantage of being concise, and of being placed in juxtaposition with the comments of the two Mills upon the same topic. Both J. S. Mill and Professor Bain show conclusively enough the defects of the elder Mill's treatment, but differ somewhat in their own estimates of the nature and bearings of the phenomena in question.

§ 3. That belief is not solely inseparable association, argues J. S. Mill, appears from the fact that those inseparable associations which seem to generate beliefs do not generate them in everybody. The generality of mankind believe they see distance, extension and figure, though all they really see is the accompanying optical effects, the rest being matter of association. But the associations are just as inseparable in the minds of scientific men who know what the facts are, although in the case of such there is no belief. And further, there frequently exist in the mind associations of an opposite and conflicting character, with one of which belief is connected and with the other disbelief. If then we can represent in imagination either of two conflicting suppositions, of which we believe one and disbelieve the other, neither of the associations can be inseparable. We can represent

to ourselves either the sun sinking below the horizon, or the horizon rising to eclipse the sun; we believe that the latter is the true state of the case. A person may have an habitual belief that there are no such things or beings as ghosts; but there may be occasions when, as under the influence of terror, he thinks he does see a ghost. A momentary belief in ghosts breaks in upon the normal belief. The associations then by which a belief in ghosts is negatived cannot be inseparable, and certainly those are not so by which the belief is generated for the moment. Belief and inseparable association then are not absolutely coincident; belief is something more than or other than inseparable association. After criticism of this character, J. S. Mill proceeds to review the objects of belief, to resolve all belief into memory and expectation, and finally to announce his conclusion that belief is a primordial and unanalysable experience, and that the difference between memory and imagination is an ultimate and fundamental one.

§ 4. Professor Bain considers the main difficulty in the way of understanding belief to lie in the habit of regarding it as appertaining to the intellect instead of the active part of our nature. Besides referring it to the active side of the mind, he places among the fundamental facts of belief what he terms a 'primitive credulity,' inclining us to believe everything until experience corrects the tendency. He also advances the view that, 'while action is the basis and ultimate criterion of belief, there enters into it as a necessary element some cognisance of the *order of nature*, or the course of the world. . . . Nothing can be set forth as belief that does not implicate in some way or other the order, arrangements, or sequences of the universe. . . . The state in question then, having its roots in voluntary action, has its branches spreading far and wide into the realms of intelligence and speculation.' He further thinks there is no necessity for the 'unexplained residuum' left by J. S. Mill. He also develops the important fact that belief and disbelief are the same state of mind, the opposite of belief in his estimation being not disbelief, but doubt or uncertainty.

§ 5. Mr. James Sully ('Sensation and Intuition,' Essay IV.) has contributed to the literature of this branch of psychological investigation a valuable paper, in which he dissents from Mr. Bain's idea that belief is resolvable essentially into the mind's activity. According to Mr. Sully, the explanation of belief is 'to be found in the transition from a sensation to an idea.' 'Every

idea has an inherent tendency to approximate in character and intensity to the sensation of which it is the offspring.' In belief there is 'the reproduction of a past sensation by the medium of a present idea felt to be like it.' 'The present idea distinguished from the absent sensation gives the state of belief that the absent was once present.' By means of this theory, Mr. Sully thinks the most complicated cases of belief can be resolved.

§ 6. After examining these various discussions, one is struck with the thoughts, first, that the subject is not in any or all of them perfectly freed from confusion; yet, secondly, that facts are lying about in sufficient number to give a satisfactory explanation of the phenomena, if only those facts were gathered up and arranged in their proper places. I may be pardoned, therefore, for advancing what follows in aid of such a result.

§ 7. We shall find an examination into the nature and sources of Belief to involve an inquiry into the sources and nature of Knowledge. What contributes to make clearer the one, can be made auxiliary to an explanation of the other. Before reviewing the elements of knowledge, however, a preliminary survey of the objects of belief may serve to narrow and define our inquiry. In this introductory task, we need not go very far beyond the analysis made by the elder and the younger Mill, which is an exhaustive one, and which in its general line of procedure I shall venture to follow in my own order and language.

§ 8. We do not use, ordinarily, the word *belief* in connection with a present feeling or idea. I may have a sensation of cold, and say I believe I have such a sensation; but, unless I am identifying the sensation, I mean nothing more than that I have it. Equally so, if I say I know I have a sensation of cold, I mean no other thing than that I have the sensation. Similarly of any pleasure or pain; I have it or I do not have it. It is not maintained that belief proper is altogether absent in any of these experiences; quite the contrary will, I think, be shown farther on; but we may allow safely that the term *belief* is inappropriate so far as the experience is presentative.

§ 9. The primary objects of belief are real occurrences which have happened to ourselves. We believe that such and such things have happened within our experience; from these we pass readily to anticipatory beliefs—that such and such things will happen, but the first is the simplest case. I believe my father was a tall man. I believe that I saw in my youth the New York riots. I

believe that I moved my foot two seconds ago, or that a moment before I began to write this sentence I thought of a dog which is accustomed to howl in the yard underneath my window. In all these matters of experience, whether they occurred a second or ten years ago, belief is inextricably interwoven with memory. We believe nothing that we do not remember; and everything we remember is also a matter of belief, at least so far as attributing it to our experience is concerned.

§ 10. Next we note belief in the existence of things. This is something more than belief in sensations which we have experienced, and something more than present experience of sensations. It includes (1) belief in existences present to the senses; (2) in existences not present to the senses, but of which we have had past experience; (3) belief in the future existence of that of which we have had experience; and (4) in existences of which we have had no experience at all, and which may be either past, present, or future.——(1) The experience of any object present involves a multitude of associations of one kind of sensation with another, some of which associations are not present. Perceptions of distance, direction, and magnitude all arise from tactual sensations associated with visible. When the distance of an object is determined by the sight of it, the tactual associations are not present. They are, however, reproductions of past experience, and hence are a matter of memory. There is the additional association that under certain conditions the reproduced experiences may again be actually experienced. I have not only the tactual associations but the association of myself again having the tactual sensations which I once had in connection with an object. I see an orange, and my belief in the existence of the orange is simply in the experience of the sensations of sight and in the associations of other sensations of touch, odour, and taste, which (*a*) I recollect having had from an orange, and (*b*) which I think I could have again if I touched, smelled, and tasted the fruit. What is believed are the associations, not the actual present sensations, and these associations are of things which (*a*) have been experienced and of things which (*b*) there is a possibility or expectation of experiencing in the future. In the case, then, of belief in existences present to the senses, belief consists of memory and expectation, the latter being a word which itself requires considerable explanation, to be given by-and-by, but which is convenient for use at the present stage and is not mis-

leading.——(2) Belief in existences not present, but of which we have had past experience, is nothing more than a reproduction of a past experience to ourselves. We remember that we had a particular experience. This may and does postulate the belief of the preceding subdivision, namely, belief in a present existence; for my belief in the existence of things which I recollect having seen involves a recollection that I believed in their existence at the time when I saw them. Besides, the case of belief now under consideration often merges in the preceding case, as when we believe that the trees we see from our window existed yesterday and are now existing, or that our friends whom we saw a month ago are still living, though absent. Into this case, therefore, no new constituents enter. The belief amounts to memory, and with it expectation is postulated. A prominent example of belief in the existence of things not present to the senses, but of which there has been experience, is found in the associations of cause and effect. The reproduction is not merely of myself having sensations, but of the sensations following each other in a more or less variable sequence and of forces existing as noumenal to the sensations. An antecedent becomes associated closely with its consequent, so that when one is reproduced the other is evoked also. Cause and effect are likewise in the category of belief in future experiences and existences.——(3) Belief in future existences of which we have had experience demands that we have (*a*) an idea of that which we believe, and (*b*) an expectation that it will exist in the future. This idea of the thing which we are to make an object of belief is some reproduced experience and belief; so far, then, the case is the same as the last. Beyond this lies only expectation, the analysis of which it has been thought wiser to defer. Belief of this variety is a matter of expectation that we should have, or shall have under certain circumstances, experiences of which our past sentient life gives us an idea.——(4) Belief is not confined to our own experience, past, present, or future. We believe also in the existence of many things, present, future, and past, which have never come within our own experience, and which we do not expect to come within that experience. These beliefs are substantially that in a given condition of circumstances we should have had certain experiences, or that in a given condition we shall have them. Here belief requires (*a*) an idea of the object, event, or fact to be believed; (*b*) an idea of certain other objects, events, or facts, existing antecedently to the

first idea; and (c) an expectation that certain experiences will occur. The idea both of the object and of the antecedent or conditional circumstance is a reproduction as a whole, or in its parts, of past experiences. The belief, therefore, seems as before to resolve itself into memory and expectation. But into this variety of belief there comes very prominently the element of testimony; upon testimony depends altogether our belief in existences irrelevant to our own experience. Inasmuch, however, as testimony enters into classes of objects of belief other than the one now before us, its consideration will be deferred to a separate paragraph soon to follow.

§ 11. Having touched upon the relations of belief to a present feeling or idea; having also noted as objects of belief real occurrences which have happened to ourselves, and the existence of things present, past, and future, connected with our experience and not connected with our experience; we may now add (a) future events and occurrences as happening to ourselves, and (b) events in general not happening to ourselves. The difference between events and existences is a difference not in the things themselves, but in the way of looking at them. It is the difference between succession and co-existence. An event is something happening; events are things happening one after or before the other; these things happening are existences or at least experiences. Hence a belief in events is a belief in experiences or existences succeeding each other. Such a belief postulates a belief in experiences or existences and a succession. Succession is the only new circumstance, and a closer analysis would reveal that this also is involved in the former beliefs classified. Without going into any such examination, however, it is sufficiently evident that succession is cognised either as memory or expectation, and there is no succession without something succeeding something. Future events are looked forward to as happening to ourselves in expectation, representative processes giving an idea of the event; and events in general not happening to ourselves are believed as reproduced or expected successions of experiences and existences.

§ 12. Upon testimony is founded belief in existences and events not cognised immediately. Testimony is also sometimes an aid to belief in what has been directly experienced. We can refresh our recollection of what has happened to us by means of testimony. In all cases belief in testimony necessitates the

prior belief that the testimony is credible. I am told or have evidence, as we say, that the President is to-day at Washington, and I believe this as a fact. The belief rests upon the testimony of some friend who saw the President at Washington and came on to New York thereafter, or of a telegraphic despatch to a newspaper. In order to believe either, I must have the antecedent belief that my friend is trustworthy or that the newspaper is worthy of credit. Such beliefs as these latter are the results of a large portion of past experience. Having the belief, gathered from long experience, that certain kinds of testimony and testimony given under certain circumstances are credible, I include this particular case under the generalisation I have made. Belief upon circumstantial evidence is of the same character. Past experience teaches that certain groups of circumstances indicate certain facts; a present case is identified with those cases wherein the circumstances are of this certain character. If the case be transferred to the past and I say, I believe the President was at Washington last week Thursday; or if it be carried forward and belief be declared that the President will be there next month, no change is wrought in the conditions of believing the testimony. It all rests upon past experience of what has proved credible and incredible. Things believed on testimony, then, should not constitute a separate class of objects of belief, but testimony should be regarded as one of the means by which belief is reached, as a factor in the growth of belief.

§ 13. Finally, we believe in the truth of propositions. We believe, for instance, in the truth of the affirmation—'All men are mortal.' That is to say, we believe in the truth of the facts stated in the proposition, in this case a generalisation from past experience. We may believe also in the truth of the proposition —'The wicked will go into everlasting punishment;' this is likewise a belief in the truth of the facts asserted, in this case expected to happen in the future. All belief in the truth of propositions is belief in facts, that is existences or occurrences, within our experience or out of it; and both these cases have been reviewed.

§ 14. It is scarcely necessary to remark that the objects of disbelief are the same as the objects of belief.

Incidentally to this cursory survey of the objects of belief, if it be comprehensive of all such objects, we find, therefore, that belief involves inextricably memory or representation, direct and conditional expectation of the future. This result will guide

our thoughts into channels leading to the final conclusions of our discussion.

§ 15. The term *knowledge* is used to indicate both the operation and the products of cognition; on account of which ambiguity, among others, the term is sometimes misleading, and its use attended with confusion. In studying the nature of knowledge, however, it is tolerably evident that no progress can be made in understanding the products of cognition until we have first learned what is the process of cognition. Having ascertained, if such a thing be practicable, what the experience of cognition is, we shall be at no loss to apprehend what is an accumulation of cognitions, that is, what are the products of cognition. Our concern in this place is, then, first and principally with knowledge as the process of knowing. Let us take any simple experience and endeavour to analyse it, to discover what are the elements of cognition. To avoid complications, let us suppose a tactual sensation, apart from sight, hearing, or inferior sensation. For instance, let me conceive a simple contact with the back of my head, as if a person standing behind me should put his hand there gently. I have a feeling called a sensation: what is involved in that sensation? In the first place, there is involved a consciousness of difference I recognise a feeling as different from the feeling I had a moment ago. If it were not different I should have no sensation at all in that place, but my experience would run on without my knowing that anything was upon my head. I feel a pressure where there was no pressure before, a warmth where there was less warmth previously. In the second place, if there is any appreciable sensation, I am conscious also of an agreement, a similarity, or identity. In fact, I could not be conscious of a difference were I not also conscious of an agreement. A thing must be itself long enough for comparison in order to be said to be different from something else. When the hand strikes my head, I am conscious of a sensation continuing the same or similar from moment to moment. There is agreement or similarity of its parts. One can even go so far as to say that the term consciousness of difference has no meaning except with reference to a consciousness of agreement. Sameness and difference, like and unlike, are relative terms, either of which is devoid of significance without the other. So dependent is the one upon the other, though the two are distinct and antithetical, that consciousness of difference is made up of consciousness of agreement, and consciousness

of agreement made up of consciousness of difference. That sameness requires difference appears from the consideration that in order to establish a sameness a continuity must be made out, and a continuity implies distinguishable points; but a point distinguishable is also separable, and to say that it is separable and distinguishable implies a difference from something from which it is distinguished and separated. That difference postulates sameness is evident from the fact already suggested that while a comparison is made the terms must remain constant; and constancy involves identity or similarity. Therefore, from whatever direction we approach the phenomena, there seems no escape from the conclusion that in the cognition of a sensation like that particularised, there is a consciousness of difference and a consciousness of agreement, neither of which can be merged in the other, and both of which are fundamental and primordial. In the third place, we are required to take formal notice of what already has been anticipated, namely, a consciousness of time; and the fact that we have been obliged to make such anticipation proves the elementary character of the phenomenon. There must be some continuity of the sensation occasioned by the hand on the back of my head, in order for me to distinguish any difference in feeling: in other words, in order for me to have a feeling. Furthermore, if time is necessary for a consciousness of difference, and consciousness of difference is necessary for consciousness of agreement, time is also necessary for a consciousness of agreement. It does not appear possible to analyse this consciousness of time into either consciousness of agreement or consciousness of difference, for it is presupposed in both. There is no difference without a continuance and no agreement without a continuance. On the other hand, it is equally true that if the experience of time be examined closely, agreement and difference will be found as much presupposed as is time for them. I apprehend the sensation of the hand on my head by its continuing appreciably. If it continues, there must be a past and a present at least. It must hence be divisible into moments; one moment is not the same identically with a moment which is past; there is hence a difference. And yet the moments of time are similar and united in a whole of time, which is possible only through a consciousness of agreement. It can be said, therefore, that each of the three elements thus far found presupposes the others, but each one is itself ultimate.

§ 16. If now we may be satisfied that there is required for my cognition of a sensation coming from the touch of a hand on the back of the head, a consciousness of time, agreement, and difference; an interesting question arises, in the fourth place, in regard to what sort of process it is by which I am enabled to affirm that the sensation now experienced is the same with or different from a preceding one. The preceding sensation is past and gone, and I never have that sensation again, though I have another which I loosely say is the same, meaning that it is similar. Yet if a sensation be gone utterly, it is out of mind wholly, and there is no way by which I can tell whether it is different from or like another sensation. Comparisons cannot be made when there is only one term; in order to compare there must be something to compare with something. We are hence compelled to posit a mental representation of the sensation had a moment ago, in order to declare that the sensation continues, that it is the same with or different from a present sensation. On scrutinising this mental representation to see if it cannot be decomposed into something else, a suspicion that it is so decomposable might be generated by the discovery, which can be made, that this process of mental representation presupposes the three elements already brought out. For, if I am conscious that a sensation is represented, I must also be conscious that it is the same sensation I had before; that it is the same implies that it is different from some other; and that it is a past sensation implies time—a sensation as continuing and as completed in the past. Is there, after all, anything new in this consciousness of representation? If we aver that there is not, the query above propounded is still unanswered, and the difficulty recurs with undiminished force. How can I compare a present with a past sensation to know that the two are alike or different until first the past sensation is restored? If I could compare something with nothing, the question might be answered; but till this can be done it seems unanswerable upon any hypothesis other than that the experience of representation is an original, fundamental, unanalysable one. We shall, therefore, be justified in adding to the three elements of cognition heretofore found a fourth, which may be called consciousness of representation. And we shall notice the same curious interdependence between the four elements thus ascertained which existed when there were only three. It has already been disclosed that representation involves agreement, difference, and

time; it is in equal measure true that each one of the latter involves representation. This may be seen, once for all, in the phenomena of time. Continuance means succession; succession is something succeeding something. It cannot be known that the later something follows the earlier something, unless the earlier leaves an impression, or is represented. Conceding then that consciousness of representation is involved in consciousness of time, it must be allowed to be involved also in consciousness of agreement and difference, for the latter two are, as has been seen, themselves inexplicable without the presupposition of a consciousness of time.

§ 17. The manner in which the expression *consciousness* has been used to describe the elements of primary cognition may perhaps excite comment. These elements have not been stated as merely difference, agreement, time, and representation; but as consciousness of difference, consciousness of agreement, consciousness of time, consciousness of representation. It will now be explained why these collocations of words have been employed. When I feel and become cognisant of the pressure of the hand upon my head, I am cognisant of a difference, agreement, continuance, and representation. That is to say, I am cognisant of a certain experience which *I* refer to myself as an actor or sufferer. This cognition is no cognition if *I* do not cognise. Underneath all is the Ego, the *I* which experiences, the *I* which knows. We mean then in using the term consciousness of agreement, for example, an apprehension of agreement by self, a reference of the experience to self. This reference is not itself a consciousness of agreement alone, for it is the *I* that is conscious of the agreement, and I am conscious that it is the *I* which is conscious of agreement. In other words, there is consciousness of an underlying something, which all these varieties of consciousness presuppose. A similar line of remark may be made to show that this reference of an experience to a self is not the same thing as consciousness of difference, time, or representation, but is presupposed in each of them. It is then incumbent upon us to add a fifth, and, if possible, still more fundamental, element to the others thus far elicited. This might perhaps be termed a consciousness of self; but the name *self* or *Ego* is the only mark we have to indicate subject-mind, a subject which is always behind every mental exercise and which never can be reached, but eludes all circumscription. And inasmuch as in the study of mind we are

thus forced to objectify mind, some term which should point clearly and unqualifiedly to the fact of such objectification would seem a desideratum. The phrase *consciousness of power* is, perhaps, better calculated than any other to express this fundamental consciousness, especially as it can be characterised and distinguished readily as active and passive, thus corresponding to the two modes of mental experience, and as, in addition, it suggests analogy and at the same time makes antithesis with *force*, which is the ultimate of ultimates in the world of *not-mind*. In the fifth place, then, we write down consciousness of power as an element of cognition. It has just been observed that this consciousness is postulated in all the other elements, and it does not need detailed exposition to reveal the fact that consciousness of power in its turn demands the other four. This can be demonstrated as in the preceding case. Certainly the consciousness of power implies the consciousness of something continuing; and continuance presupposes representation, agreement, and difference.

§ 18. There are, therefore, in the cognition of a simple tactual sensation, five elements, which cannot be analysed further, cannot be sublimated into each other, and cannot be separated from each other. This, I think, exhausts the matter so far as the particular experience in question is concerned. It still remains to ask whether all cognition is the same, or whether in any cognition there is aught more or other than what has been found. I feel confident there is not: but inasmuch as no opportunity exists within the limits of this chapter to go into a very full examination of special varieties of cognition, I shall be obliged, after taking up two or three which might present difficulties, to throw upon other minds the burden of seeking and bringing forward a cognition in which is something more than, or something different from, what has been pointed out.

§ 19. So far as can be determined, our earliest cognitions do not occur in connection with sensations of the character of that just used as an illustration. The feelings of which that is a type seem to come upon the passive mind; our first cognitions proceed from the mind's activity. Energy is put forth in movement, and meeting with resistance, consciousness is evoked. But still, allowing this, there is no difference in the elements of cognition from the case of experience of a sensation. Suppose a child putting out his arm and striking some resisting substance, as the mother's

breast. At the point of resistance, a difference is generated in consciousness between the impinging energy and the force which opposes it. Having given a consciousness of difference, all the other elements posited can be deduced by a process of examination like that just concluded.

§ 20. The general discrimination of self from not-self develops also the same elements brought out in cognising a simple sensation. This discrimination probably is first made upon some such experience as that last mentioned. Such a discrimination obviously requires consciousness of difference, for discrimination means making a difference or differentiating. It also necessitates a consciousness of a personal identity from moment to moment. This knowledge of personal identity is not attained without cognition that I am the same self which had a certain experience a moment ago. There arises here precisely the same difficulty which arose in considering how to explain the ability to decide whether a sensation experienced in the past moment, and which is gone, is the same as that experienced in the present moment. How can we compare something present with something absent? In the case of personal identity, as in the case of identity of sensations, I can advance no other explanation than may be found in the fact of an original and primordial consciousness of representation. Conceding this, all the other elements take their places without confusion, and the five seem to exhaust the cognition. In cognising personal identity we objectify ourself, and the cognition is as much cognition of an object as is the cognition of a sensation. Subject-mind cannot be brought within the limitations of thought.

§ 21. Let us now suppose that, instead of having a sensation of a hand upon my head, I have only a recollection of such a sensation; in other words, an idea of such an experience. Here the cognition is duplex. In the first place there is a presentative cognition of the idea itself. I know I am having a certain experience. In this appreciable experience of having an idea, cognition is evidently of the same character as in having an original sensation. I am conscious of a difference between the idea and a preceding experience; of an identity of the idea with itself; of representation from instant to instant in order that there may be any identification; a consciousness of time; and a consciousness of a power evolving and sustaining the idea. So far the experience, though involving representation, is comparatively presentative

But cognition goes further. I cognise the fact that the whole ideal experience is itself a representation of what I have had antecedently. I know it to be a copy or reproduction of a past experience. Now what is involved in this cognition? In reply it may be said that at the outset there is a resemblance or an agreement between the copy and the original. Furthermore, the copy is not the same as the original: that is, there is a difference between them. Thirdly, there is a distinct consciousness that the original is represented. Fourthly, there is a consciousness of continuance of the experience: and, fifthly, a consciousness of a power reproducing and suffering the reproduction. Thus we have over again the elements of cognition of a sensation, and we do not seem to be able to get beyond them.

§ 22. Again, I have many ideas which, in their entirety, do not represent any sensational experience. The mind has a tendency to associate contiguous impressions. These cohere, call each other up in representation, separate and segregate, forming out of fused parts of past experiences new wholes which are not as wholes copies of any real experience. In these cases of new combinations the effect is something like that of an original presentation. It is cognised as something different from a sensation, and yet a copy of no particular sensation, though its parts are copies of past sensations or portions of past sensations. Let us assume, for illustration, that in the process of association there comes into the mind the idea of an animal with the body of a sheep, and the head and neck of a man. This, we say, is a creation of the imagination. In this experience we have a cognition of the idea as a distinct continuing idea; this needs no further explanation. Besides, there is consciousness of a representation of that experience we call the body of a sheep; also of that which we call the head of a man. We know that both these are reproductions of past experience. But when the two are associated together, we have no consciousness of the whole being a reproduction of any thing we have ever seen. There does not, however, seem to be any explanation why we are conscious in the one case of representation, and why we are not conscious of it in the second case, except by stating the fact. Similarly with every product of imagination: the parts which make up the idea are always representative, often highly so; by differences of collocation wholes are produced which are not, as wholes, representative but presentative ideas. Out of new combinations of

materials furnished by experience, wholes emerge which are not copies of experience. The process by which these results are accomplished is not a new or different power of the mind involving new elements of cognition from those already considered. The process, the manner of succession, the course of representation, has its own laws based upon the observed order and sequence of representations, which laws do not concern us here, inasmuch as they are relatively secondary laws of mind. There must first be cognition before there is association of cognitions

§ 23. It seems, then, that every experience induces a modification of mind more or less permanent, by which the recurrence of that experience is possible, and by which, when it recurs, that return is known as a representation of past experience. The cognition of it as representative is primordial and ultimate. The mind also, in the process and sequence of representations, in effect consolidates and integrates experiences into new wholes which present themselves as units, upon which in turn, as if wholly original, the mental forces operate to preserve and represent.

§ 24. We have now arrived at a point where we are better able to understand belief; and if the foregoing analysis has been successful, the true location of belief will have been more or less definitely suggested. In our prior enumeration of the objects of belief, we found belief to be interfused with memory and expectation. Bringing together the results of this examination, and the analysis of the elements of cognition, just finished, it will not be unsafe to assume that the terms *memory* and *consciousness of representation* cover essentially the same ground. *Memory* is the name given to the power or ability to recall events; *recollection* is the name given properly to the act of remembering. *Consciousness of representation* applies both to a given consciousness in a particular act of representation, and to the consciousness of a general and continual process of representation going on and having gone on in our experience, that is, the consciousness of a power or ability to remember or represent, expectation being postulated with it. If we are permitted thus to identify memory and consciousness of representation, we shall be able to assert that so far as we have made out belief to be memory, so far also we have shown that it is consciousness of representation. We shall hence be spared the necessity of giving further illustration of the fact that belief falls in with consciousness of representation.

§ 25. We have also found, however, that belief inheres in expectation. It is important then to settle the position of expectation and make clear what is the experience thereof. To explain belief by the word *expectation* is not of very much avail, for it would be a difficult task to explain expectation without belief. Nevertheless attention to the laws of association and representation for a moment will enable us to see more precisely what is meant by expectation. Granting the fact (which has been proved abundantly by psychologists) that certain associations tend to inseparableness and become inseparable, one important step in elucidation is taken. Let us make use of a simple illustration: I believe that the sun rose yesterday morning. This is a representation of an experience that occurred to me yesterday. With this represented experience (and with the original also) is associated the representation of another and another and another—numerous experiences, a series, of the same sort. I have a recollection of certain divisions of time past which I denominate mornings. Whenever I think of one of these divisions, there arises, inseparably connected with it, the idea of the others. I follow along the line backward and never reach the end. When I think of a last morning (that is, last in the series), the association of another still beyond rears itself. I then return over the same line till I come to yesterday. The association of this morning springs up as still more recent. The idea of this morning by irresistible association brings forth the idea of another morning, which is the idea of a future; and from that the process goes forward without end in the same manner as in the opposite direction. I distinguish this idea of a to-morrow morning from the idea of a yesterday morning by the particular consciousness of representation which is involved with the idea of yesterday, and absent from the idea of to-morrow. I recognise the idea of yesterday as a reproduction of an actual experience past and gone. The idea of to-morrow I recognise as a copy of that actual experience, but without the representation of its having actually occurred. Now when I review my experience of mornings, I find inseparably associated therewith the idea of the sun rising. I have a consciousness, too, of a representation of the fact that the sun actually rose, and I witnessed it on each of those occasions. (It is not necessary to take into account days of obscuration and late rising.) Therefore, as the idea of a to-morrow morning occurs, there is united with it the association of myself as witnessing the sun rise, or witnessing it having

risen. This is expectation or belief that the sun will rise to-morrow.

§ 26. So also the process is similar when I believe a thing will happen to me of which I have had no experience. I believe I shall go across the ocean to London; a place which I have never visited, having never been beyond the seas. In order to have such a belief, I must have a distinct idea of going to London. This idea is derived from past experience. Upon testimony I believe that others have gone to London, and, recognising myself as similar to others, I attach the idea of myself to the idea of going to London. Certain circumstances, as pleasure of travel, or calls of business, make me desire to go to London. I have an incipient volition to go. If there be no opposing considerations sufficient to deter, I form the intention of going. My past experience has been that whatever I have intended to do (which any one may do) I have more or less regularly done. Accordingly, I class this intention with other intentions fulfilled, and transfer by association the idea of a fulfilment of intention to the idea of going to London. I then say, I believe I shall go to London, or I expect to go. There is no new element of cognition introduced; there is only a peculiar arrangement of cognitions.

§ 27. Again, we may take the belief in death, to come to me in common with other men. This belief arises from a common observation of certain phenomena called death, as occurring to all sentient beings, with which class I associate myself. Many men of whom I have heard have died; the number of those who have died is vastly in excess of those now living. The associations of death thus come to be connected with all men, and with myself among the number. I believe, therefore, that I shall die. But I recognise the ideas as divested of the representation which is present when an actuality, an event already happened, returns in idea.

§ 28. Conditional expectation furnishes a higher complication of association, but does not bring in any new elements. 'I expect to go to Boston, if John goes'—requires an idea of John going antecedently, and an idea of myself going consequently. My intention to go depends upon his going. My belief is, that I shall go—not absolutely, but after some other event shall have taken place. These various ideas are made up of representative material; the expectation involves a difference in order and association, but postulates the same elements of cognition as in recol-

lection. So also where a belief is generated in connection with a condition contrary to fact; 'If John had gone to Boston, I should have gone'—may be analysed roughly, as follows: John did not go to Boston; I did not go; it was possible for John to go; it was possible for me to go; John's antecedent going made it desirable for me to go, and associated with his going I had a desire and intention to go; my intentions in the past similar to this have been fulfilled generally; the idea of myself going under certain circumstances is associated with the idea that those circumstances did not exist (though possible), and that I did not go. I declare, therefore, 'I believe I should have gone.' My expectation thus appears to be a combination of representations. That John did not go and that I did not go are both representations; that it was possible for John and possible for me to go are beliefs coming from past experience; the association between my intention to go and his going is representative; the generalisation in regard to fulfilment of intention is also representative; and so forth. Expectation, then, seems to be nothing more, intellectually considered, than representations of past experiences, associated together in certain peculiar modes.

§ 29. The state called expectation is further marked by a volitional condition of preparedness to act, indicating desire, intention, or resolution. This does not constitute the belief, which depends more directly upon the associations, but varies with the strength of the associations and of emotion accompanying the same; and as the volitional impulse varies, so the expectation is said to be stronger or weaker. This determination toward action seems an essential characteristic of expectation.

§ 30. From what has been elicited thus far, it follows that consciousness of representation is a fundamental element in the act of believing. But it has been shown in some detail that consciousness of representation involves and presupposes consciousness of agreement, consciousness of difference, consciousness of time, and consciousness of power. Each one of these four, consequently, must be postulated also as primitive elements in believing. And the examination thus far conducted reveals no other intellectual constituents, nor is it easy to suggest any other. We shall be forced then to the conclusion that these are the ultimate facts of belief.

§ 31. But now an apparently serious objection will, undoubtedly, be made. According to this analysis, it will be said, to believe

and to know are precisely the same thing; both have exactly the same constitution. To believe is to be conscious of representation, agreement, time, and so forth; equally so is to know. In answer, it may be urged that because a power has a certain and uniform constitution, it does not follow that all its exercises are the same; and if there be exhibited two quite dissimilar or two opposed phenomena, we are not wholly precluded from ascribing to them a common origin. They may be the obverse of each other. The differences may be in the attendant circumstances, and not in the source. It is very evident that, when using language accurately, 'to know' does not mean the same thing as 'to believe.' But, so far as we are able to make out, the process, the act is, in the two cases, absolutely identical. We must look, therefore, for the real difference to that upon which the mental process is exercised, or to the manner of its exercise. And it will not take us long to discover that difference.

§ 32. Let us discard for the moment the words *knowledge* and *belief*, and signify the act of mental apprehension by the term *cognition*. In order that there may be cognition, there must be something cognised. That which is cognised is broadly distinguished as presentative and representative. Accordingly, we may distinguish cognition into presentative and representative cognition. Now it is true that there is no presentative cognition that does not also involve representative; and no representative cognition that does not involve presentative; but there is a preponderance of one over the other. There are times, as when great strength of feeling prevails and the mind is engrossed with a powerful sensation, when the state of cognition is a conspicuously presentative one; there are other times, as in a train of reflection, undisturbed, when the presentative side of the experience is mostly underneath and the representative in the ascendant. In proportion as cognition is presentative we are said to know; in proportion as it is representative we are said to believe. Cognition, viewed on its presentative side, is knowledge; on its representative side is belief. In other words, belief varies as the representative element. These statements are in full accord with the results of the foregoing analyses. Belief exists in expectation, which is a highly representative experience; in the reproduction of all sorts of past experiences simple and complex; but is not ascribed to the experiences of sensations, or of ideas, as ideal presentations. If then we were asked to define believing, we could say that it

is representative cognition, or more exactly, perhaps, the cognition of an experience as representative. To call it the cognition of a representative experience would not answer the purpose, for such a cognition might be a knowing if it merely took cognisance of an experience, which happened to be representative. When, however, it cognises the experience *as* representative, the cognition is a believing.

§ 33. More clearly still appears then the intimate connection between knowledge and belief. They are not only the same in elementary constitution, but they exist concurrently, and one is necessary to the existence of the other. They are the obverse of each other. We have seen that there is no cognition without representation, and every representation involves belief; and there is no representation without presentation, so that all believing involves knowing. The two are primordial and complementary. The same interdependence is observable when knowledge and belief are regarded as products. Knowledge as a product is the accumulated body of cognitions which form the mind's furniture. These cognitions are representative mainly, and composed of representations. The stock of knowledge is hence made up by many acts of believing, and is itself a vast congeries and aggregate of beliefs. No antithesis should be made, therefore, between knowledge and beliefs as products. Our beliefs are a part of our knowledge, and by far the greater part.

§ 34. The differences in what is commonly termed the intensity of belief furnish confirmation of the views here maintained. Some of our beliefs we are accustomed to regard as very strong; others we consider exceedingly weak. I have a maximum of confidence that to-night will be succeeded by morning, or that the stone I throw up will fall to the ground. I have a moderate degree of trust that the morrow will be fair and cloudless; a small degree of belief that a stone thrown by me will strike a bird on the fence-top. I believe weakly that Captain John Smith had his reputed adventure with Pocahontas. An inquiry as to the explanation of grades in the intensity of belief elicits only the fact that the difference is a difference in strength of representation. This strength of representation may be either a tenacity of union between two associations by virtue of which they become more or less inseparable, or it may be reproduced strength of feeling connected with the experience. I may believe, implicitly, that my mother whipped me on a given occasion. The circumstances of

the whipping are reproduced with great vividness, and there is a representation of the feelings then experienced to a degree sufficient to cause cringing, anxiety and distress. Particular associations call out strong forms of emotion which attach to those associations and are represented; these emotions hence attend our beliefs and make them stronger or weaker, as we say. The intensity, however, is intensity of feeling accompanying the associations, and does not constitute the associations, nor does it constitute the belief. In such cases, by intensity of belief is meant intensity of feeling concomitant with belief. In the other class the term strength of belief indicates the strength of the associations. In the example of Captain John Smith and Pocahontas above cited the belief, whatever it is, rests upon testimony. I first read the story of John Smith and Pocahontas at a very early age in some history. I had been told by my parents or other instructors that what was related in this history was true, and my uniform experience had been that my instructors and parents told the truth. Accordingly, I believed the story in question. I read the same given as fact in other books, and every time I thought of the incident there was represented a strong association between the story and an actual occurrence of the facts therein stated. My belief, therefore, was strong in the truth of the narration. But a few years ago I met with considerable sceptical criticism of those accounts. The former association was weakened thereby, and now, when the narrative is brought before me, the association between the story and actual fact is weak; in the same measure my belief is weak. So also my uniform experience has been that night is followed by day; with the thought of night is reproduced inevitably the association of day. On the contrary, the idea of a cloudless day is not represented with certainty. My experience has not been that days are uniformly cloudless; many of them have been just the reverse. The belief then is more or less variable, according as I see certain signs which evoke past associations of various degrees of strength pointing on the one hand to cloudiness, and on the other to clear sky for the morrow. The same principles obtain in the other examples. My experience of gravitation is uniform; my experience of the certainty of my aim has been variable. In the one case there are strong associations growing out of the uniformity; in the other the associations are weak, because of the variations of experience. My belief is dependent upon these uniformities and variations of association, waxing and waning with them.

§ 35. The word *belief*, or its verb, is sometimes employed to express a less degree of certainty than the word *knowledge*, or its associated words. I ask a person if he knows a certain thing, and he answers: 'I do not *know* it, but I *believe* it;' intending thereby that he is not so certain of the thing in question as if he knew it. In all such instances, I apprehend, the speaker makes a distinction, by which he includes under the term *knowledge* the 'things we see,' and the things seen remembered, while belief is of things to which testimony is borne. A very little reflection must convince one that both this distinction and any assumed difference of certitude between knowledge and belief are vulgar errors born of and breeding confusion. In the first place, the line between believing and knowing is not correctly drawn; there is as truly belief in remembering one's own experience as in relying upon testimony of other people to what one has not one's self witnessed. And secondly, while it is very often true that belief on testimony is less reliable than the remembrance of a personal experience, it is equally the fact that, in many cases, a direct experience and remembrance are not, objectively considered, as trustworthy as an opinion based on testimony. I believe that the city of Paris exists; this is, in my case, a belief on testimony. I believe that I called with my father on Oliver Wendell Holmes, when I was six or seven years old. In my recollection of what occurred at so early an age, I might readily be mistaken and confound the experience of somebody else with my own. This is not of infrequent occurrence. Prof. Bain ('Emotion,' etc., p. 535) cites an instance of a late distinguished man who had some time before his death, at a great age, declared positively that he had seen Mirabeau in London, though the known facts of Mirabeau's history were entirely against him. But my belief in the existence of Paris may rest upon an immense weight of testimony in regard to which the probability of error is infinitesimally small. Such a belief is more trustworthy than are many beliefs from remembered experience. And, subjectively, there is exactly the same degree of certitude created by a state of belief as by one called of knowledge. We are accustomed to consider that there is no higher degree of certainty than of things immediately present to our senses. True enough: but without the assurance that I saw a second ago the tree I am looking at now, my present certainty of sight falls to pieces from lack of continuity. The certainty that I saw the tree a second ago is a certainty of belief. Belief and knowledge,

therefore, are alike as to certitude, varying equally and according to the same laws. We are not more certain of a thing because we know it than because we believe it, nor the converse. Certainty depends upon the union and integration of associations; a strong association begets certainty, a weak one uncertainty, and associations involve both knowledge and belief. The popular antithesis as to certitude between knowledge and belief is hence wholly fallacious. It would lead to much less misapprehension, if instead of saying to indicate my assurance 'I know it,' I should say, 'I am certain of it;' and if to denote a less degree of certainty, in place of the expression 'I believe it,' I should employ some qualifying phrases as 'I am not quite certain of it,' or 'I am tolerably (or moderately) sure of it.' It is quite hopeless, however, to relieve language of ambiguities or to purify its use by suggestion, no matter how patent may be the imperfection or misuse. Augean stables could more easily be cleansed with a hose-pipe.

§ 36. Before summing up I will advert again to some of the views mentioned at the beginning, and first of all to Professor Bain's. This psychologist lays down as 'the genuine, the unmistakable criterion of belief,' 'preparedness to act upon what we affirm.' But how can my belief in what is past be considered preparedness to act when there is no occasion for action? He answers by saying - 'I believe that I yesterday ran up against a wall to keep out of the way of a carriage.' I have no disposition to do anything in consequence of that conviction; yet I call it a conviction and not a mere notion, because I am affected by it in the same way as I am by another recollection that I do act upon. I feel that if there were any likelihood of being jammed up in that spot again, I should not go that way if I could help it, which is quite enough to show that in believing my memory, I have still a reference to action more or less remote. It may well be doubted whether the thought that I should avoid such an experience if I could, has anything to do with the state of belief; the belief is complete without that. The mere recollection of the circumstance is sufficient for belief. I may have no more thought of avoiding than is necessitated by the representation of my own efforts to get away at the time I was jammed up; I may not even have that and yet believe. Moreover, supposing while I stood in the narrow passage-way a stone had fallen upon my foot: the pain would have generated a 'preparedness to act,' would have demanded action; and yet the experience would have been

an entirely presentative one, a matter of knowledge and not of belief. We might as well say, then, that 'preparedness to act' is a criterion of knowledge. So far as I am able to make out, 'preparedness to act,' in Professor Bain's view, means nothing more than incipient volition in the forms of desire, intention, resolution, and the like; and these certainly are no more attendant upon belief than upon knowledge. Of course it may be freely allowed that volition is present in all mental experience; that every state of consciousness has its volitional side. So far forth then as all mental states involve belief and all have a volitional side tending toward activity, so far and no further is preparedness to act associated with belief and the latter with the former. This is the modicum of truth in Professor Bain's idea. But to make such a determination toward action the *test* of belief is unsatisfactory and inconclusive; it does not explain anything. Even in expectation, with reference to which the phrase has a force not elsewhere obtained, the belief is after all a matter of representation, which is conceivably separable from the volitional impetus existing in expectation, although the latter be present also. The expectation that I shall go to Philadelphia depends upon a number of representative beliefs, the union of which generates this particular belief and which carry with them a volitional impulse, though the latter is not an essential element in the belief any farther than volition is essential to all cognition. A state of weak belief, so called, may be as completely and perfectly belief as if it were stronger, though in the former case it does not develop with it the preparedness to act which it does in the latter. An affirmation involves belief, which *is* belief in all essential qualities, though we may not be prepared to act on what we affirm. In fine, Professor Bain does not seem to me to be as successful in his attempt to ally belief with activity principally as are those who regard it mainly as an intellectual state, and he himself recently seems to incline to the latter view ('Ment. and Mor. Science,' Note in Appendix).

§ 37. Nor is one satisfied with Professor Bain's factor of a 'primitive credulity.' To say that belief is founded upon primitive credulity means no more than that knowledge is founded on primitive cognition. If, however, as we may possibly suppose, he intends in this language to affirm that belief is a primordial experience, he has enunciated an important truth; but it is to be regretted that he did not make his meaning a little clearer. He

seeks to support 'primitive credulity' as a leading element in belief by calling attention to what he considers the fact that 'belief is distinguished when we suffer the shock of a contradiction, a check, or disappointment in some career of activity.' Apparently he means that we believe everything without knowing that we believe, till we are contradicted and our confidence receives a shock. Then from repeated disappointments scepticism is produced, and we have 'two opposing tendencies—primitive credulity and acquired scepticism.' The fair inference from his statements is that 'acquired scepticism' is not belief at all, but the opposite of belief. Now, if the preceding examination has been a thorough one, it will be evident that this acquired scepticism is not explicable except under the supposition that it also involves and requires belief. In early childhood I believed what everybody told me; when any person theretofore unknown told me anything, I reproduced past experience of the truth of whatever had been told me, and in accordance therewith I believed the new comer's statement. But presently I found that something told me was not true. An association was then started between a story told and a state of facts contrary. Not being more fortunate than the generality of mankind, I soon had a stock of these latter experiences. Accordingly, when a person now tells me something, I have a representation of various cases where there is an accordance between what is told me and the fact, on the one hand; and on the other, a representation of various cases where there was a non-accordance between what was told me and the fact. In regard to the former, I believe that I did meet with such accordant experiences; in regard to the latter I believe that I was in such ways deceived. Both are matters of belief, and I am at a loss whether to associate the present tale with the one class or the other. Associations pulling in opposite directions create a state of uncertainty and perplexity. Doubt is not the absence of belief but the opposition of beliefs; as association widens its range they continually contradict each other, creating as far as action is concerned wavering and hesitation. With this differentiation of associations and the following integration belief is all the time and all the way through involved, and is never absent. The conflict of motives to action occasions deliberation, and in that deliberation the component parts of thought are beliefs in one direction and another, varying according to remembered experiences, drawing this way and the other and every way, until the strongest set of

beliefs overpowers the others, and determines action. Where the stock of represented experiences is smallest, there the credulity is greatest—not, however, because there is more belief, but because there is less; that is to say, because there are represented fewer beliefs in experience and there is less contradiction of experiences. So incredulity or scepticism indicates not a small number of beliefs but a large number; so large that they balance and hold each other in check. Is there then no opposite to the state of belief? it may be asked. I answer, no more than there is to a state of knowledge. The term *ignorance* may express the opposite of both: but this must be taken in a limited sense; we are never in a state of absolute ignorance. Perhaps *unbelief* might be used as an opposite of belief, if its meaning of simple absence of belief could be preserved and it is not confounded with *disbelief*, which is belief in a contrary or contradictory. This word, however, must be employed qualifiedly, with regard to some specific object or objects of belief. We are never in our conscious experience, out of a state of belief; although we are not always believing the same thing, or believing in the same degree of association, or with the same associates of feeling and volition.

§ 38. Professor Bain is quite right in placing as a necessary element in belief, 'some cognisance of the order of nature.' But the order of nature is nothing more than our uniform experience in certain directions by which inseparable associations are generated and represented continually in our mental life. As these representations are made, we believe; and in proportion to the strength and uniformity of such associations our belief is strong.

§ 39. The question may again force itself upon our attention at this point—Is not, after all, belief, as James Mill thought, simply inseparable association? The reply must be in the negative, because there is belief when the associations are not inseparable. But may it not be at least association and nothing more? Still the answer must be, no. It is not association because it is presupposed in order that there may be any association at all. A careful reperusal of the earlier of these pages, wherein I endeavour to show that belief is involved in every representation, and that no cognition and hence no association is accomplished without consciousness of representation, will be sufficient, I think, to satisfy this query, without further repetition on my part. Again, therefore, we are brought to the conclusion that belief is primordial and an original part of cognition.

§ 40. I am unable to discover in Mr. Sully's idea of the origin of belief anything more than cognition of experience as representative. He considers that in 'the partial reproduction of a past sensation by the medium of a present idea felt to be like it, one seems to find the origin of the oldest and most simple form of belief. For, as sure as this experience becomes possible, and the present idea and the absent sensation are distinguished, it seems certain that the mind would fall into the attitude of belief with respect to the absent sensation. In other words, if the infant could fully describe to us its state of mind, it might not improbably do so by saying, "There is something in my mind that carries thought away to another thing brighter and better than itself, which thing is not exactly in my mind just now, but yet seems near and ready to enter it." In the inexplicable fact that a present idea carries on its face the mark of its origin, and reminds of the sensation which preceded it, we appear to have the last accessible stage in the history of belief. Belief and memory in the sense of the idea pointing to the absent sensation, appear to be mutually involved in this unanalysable mental process, neither being conceivable apart from the other.' This passage exhibits Mr. Sully's views as well as does any. His position is substantially the same as that of J. S. Mill in the latter's conclusion of a radical difference between an idea as such and a remembered occurrence. The whole drift of Mr. Spencer's thought would seem to be in the same direction, and such as to authorise just these conclusions, though I am not aware that he has gone into any exhaustive special discussion of belief. Prof. Bain also, in one place, allows, I think, the same state of things contended for by Mr. Mill and Mr. Sully, when he asserts a normal power of distinguishing,—'(1) a sensation; (2) an idea of what has been a sensation or actuality; and (3) an idea of what has never been a sensation, but is artificial, though constructed out of sensations' ('Emotions and the Will,' p. 533). All these expressions seem to point to the results (1) That belief is something original and primordial; and (2) that belief is involved in some way essentially with the representative power and representation. Mr. Sully occupies himself principally with the conditions of the varying directions and intensities of belief, giving up all attempt 'to resolve the phenomenon into more primitive modes of mental activity.' Into this field we are not called upon to follow him, as our present concern is not with tracing the growth and ramifications of belief, but with a study of its sources and genesis.

§ 41. In conclusion, we may condense the results of this examination into the following enunciations:—

1. Knowledge is a product resulting from a process of knowing: Belief is a product resulting from a process of believing. The products are explained by the processes; having one piece of Knowledge or Belief, the rest is but an accumulation of things which have the same constitution.

2. Every act of cognition, from the earliest to the latest, involves five indecomposable elements, each of which presupposes and is presupposed in all the others, namely, consciousness of difference, consciousness of agreement, consciousness of time, consciousness of representation, consciousness of power. Every act of believing, from the earliest to the latest, involves precisely the same elements.

3. Knowing and believing are present, then, with the dawn of consciousness, and in every subsequent act of cognition. There is no knowing without believing, and no believing without knowing. There is no knowledge without belief, and no belief without knowledge.

4. From the beginning of consciousness, cognition proceeds in two broadly marked divisions, presentative cognition and representative cognition; the former referring to present experience, the latter to reproduced experience. This division, however, is only relative, for every presentative cognition involves and requires representation, and every representative has a presentative element.

5. Belief is allied with representative cognition, varying with the degree of representation; where the representative element is in the ascendant, the state of consciousness is said to be more of belief than of knowledge, and where the presentative element is prevailing, it is said to be more of knowledge than of belief. Believing may be described as the consciousness of an experience as representative. This is as near an approach to a definition as is here attempted.

6. The term *intensity*, as applied to belief, has no more relevancy than if applied to knowledge. What is ordinarily termed intensity of belief is either close union of associated ideas, or strength of feeling accompanying the reproduction of experiences. As feeling accompanies every cognitive experience, being another side of that experience, so feeling accompanies every experience of belief and every act of believing.

7. As every cognitive experience has also a volitional side, so

also every state of believing has a volitional aspect. No belief occurs without some volitional determination.

8. The natural history of the growth of belief is the natural history of the growth, expanse, and integration of associations. Whatever determines association determines belief. Belief follows the course of association, for association is association of beliefs in that it is association of cognitive experiences.

9. The total absence of belief is absence of consciousness; but there may be absence of belief in regard to particular objects, just as there may be absence of knowledge of particular things. The term *ignorance* covers both of the latter states, though *unbelief* in the sense of negation of belief may be more distinctively applicable to the first of the two. Disbelief is merely belief in an opposite, contrary or contradictory. Doubt arises not from absence of belief, but from conflict of beliefs.

In the discussions of the Schoolmen, therefore, as to the relative priority of knowledge and belief, both sides were right. Anselm's *Crede ut intelligas* was no more true than, and was just as true as, Abelard's *Intellige ut credas.* In knowledge is belief, and in belief, knowledge; neither exists without the other, and in the complete absence of either, conscious experience would be void.

CHAPTER XXXVII.

PRESENTATIVE AND REPRESENTATIVE STATES.

PRESENTATIVE AND REPRESENTATIVE COGNITIONS.

§ 1. MR. SPENCER'S division of cognitions (into Presentative, Presentative-Representative, Representative, and Re-representative) when simplified, marks two general classes—Presentative and Representative. The facts that representation is so essential a factor in all our mental processes that there is no purely presentative cognition, and that presentative knowledge is found also in the midst of representation have together received illustration in former chapters. Yet, to the end of showing their mutual relations and their significance in the elaboration of knowledge, it is desirable to note a little further the characteristics of each and the differences between the two.

§ 2. Knowledge as a product consists of products or results of acts of cognition. What is termed a cognition is a preserved result of an act of cognising. Such a preserved result is only the original cognising act repeated with a difference of feeling which is also cognised (I do not here go outside of consciousness). Accordingly, a mental product elaborated and preserved is a representative cognising act, or, as we say, a representative cognition. It must then be observed that elaborated knowledge—as a product of knowing—consists wholly of representative cognitions, and that presentative knowledge cannot strictly be considered as in any sense a product. Products of knowing are cognitions stored up, so to speak, and the moment the producing becomes a product, it passes from the category of presentative to that of representative knowledge. A product is a *productum*—in a past tense. Indeed, even in describing presentative knowledge we are in truth describing representative; for we are dependent upon our recollection for the accuracy of our descriptions, and recollection is the exhibition in the mind of representative cognitions. We are thus led up to the same tangle into which we are always brought when we attempt to solve the problem of memory. Reproduction is a reproduction of a past experience, and is hence apparently subordinate to an original present experience; and yet the knowledge that a representation is a representation seems to be equally ultimate and fundamental. But in full view of this difficulty it is nevertheless useful and probably indispensable to make a distinction between presentative and representative knowledge, thus forming two distinguishable though inseparable classes of cognitions. To avoid misconception, however, I repeat that what is termed presentative knowledge is after all an artificial class of representative knowledge, and that the former is not, and by its very nature cannot be, retained as a product while remaining presentative.

§ 3. Presentative knowledge, or the presentative element in knowledge, is largely distinguished from the representative by its greater vividness. A thing which we see is more vivid than an idea of that thing. The idea is a copy fainter than the original impression. Sometimes the idea approaches the sensation so closely in the matter of vividness that the two are confounded, as in hallucinations of various sorts embraced under strong emotions; the man under the influence of fear thinks he sees a ghost, the drunkard beholds as realities, horrid, distressing phantoms. But

as a rule presentative cognitions may be readily distinguished as such from the higher degree of vividness which the impression has to the mind.

§ 4. Presentative cognitions are immediate, representative are mediate. We are said to know a thing immediately when we cognise it in itself; mediately, when we cognise it through something numerically different from itself. When one sees a book upon the table, the colour is immediately cognised: on the contrary, when the mind has the thought or idea of a book, the book itself being absent, that thought or idea is immediately cognised; but the actual phenomenon of colour is mediately cognised through the idea. Immediate cognition involves the present fact of the existence of a thing; mediate cognition involves the belief in the past, present, or future existence of the thing.

§ 5. Presentative cognitions are relatively more simple, and representative cognitions are relatively more complex. In the first place representative cognitions have a double character which presentatives are without; for every representative cognition is also a presentative one when considered merely as a mental phenomenon. My remembrance of a house is a representative cognition, so far as it refers to the reality of a house known by me; in the degree that it is an idea of the mind it is presentative. In the second place presentative cognition gives no opportunity for the combination and recombination, the differentiation and integration, which is conspicuous in representative knowledge. When through the associating processes knowledge attains as a product great complexity, it is through representative rather than presentative cognition. The higher processes of abstraction, generalisation, comparison, reasoning, and the like, work out their results through representative and re-representative combinations.

§ 6. In presentative cognitions the continuing present impression is the primary object of cognition; whatever there is of representation (and the latter is never absent) is secondary and subsidiary to the continuance of the present experience. In looking at a light, my remembrance of the light being present a moment ago is secondary to the present impression of the light, and aids in connecting together the moments of continuance. On the other hand, in representative cognition, the primary object of cognition is the past impression; the present idea is secondary to the reality recalled. In remembering John Smith, the actual John as known by me in time past is the primary object of cog-

nition; the present idea of John Smith is only accessory to the recognition of the past experience. So also in believing that something will occur in the future, the occurrence which will be actual is the main object of cognition, while the present idea of that occurrence is but an adjuvant thereto.

§ 7. It has been already implied that prevailingly presentative cognitions are more original, and prevailingly representative more derivative. The meaning of the terms suggests this. It might then be said perhaps that presentative cognition is the absolutely original factor of knowledge, and that representative cognition is wholly derivative. Yet so far as we can discover, no cognition at all is obtainable without representation. We are thus forced to a contradiction; but it is only the contradiction to which we are always brought, if we attempt to pass out of the sphere of the relative. It is the same difficulty which arises in attempting to conceive of a beginning. We are all the time positing a beginning of things, but on reflection we are not able to understand how a beginning is possible; *ex nihilo nihil fit.* We say there must have been a point when arose the first item of knowledge; that item was a presentative and original cognition; but in order to any cognition or consciousness at all we find that there must be a representation of former cognition. We can only assert then that the mind makes a fundamental distinction between presentative knowing and representative knowing; that the terms are each necessary to and exclusive of the other; that in the products of knowing, some cognitions are more prevailingly presentative and some more prevailingly representative; that the former are relatively original, the latter relatively derivative.

§ 8. Presentative cognitions may be either sensational or ideal, presentative cognitions being sensations cognised or ideas; representative cognitions are ideal only. It is probable, however, that this difference is one of degree rather than of kind; a sensation is a mental phenomenon, so also is an idea which is a faint repetition of the sensation. The antithesis, however, is useful in giving a more complete view of the difference between the two classes of cognitions now under review, though it conveys no information not conveyed by the terms presentative and representative.

§ 9. There are no degrees of intensity in cognition; the intensity is a matter of feeling concomitant with cognition. The terms *vividness* and *faintness*, before made use of, depend for their meaning somewhat, if not entirely, on concurrent feeling,

and for the subsistence of the phenomena marked by them feeling must of course be invoked. The terms *definiteness* and *clearness* (in the sense of definiteness) apply properly to cognition; a cognition may be definitely marked or may be indefinite according as it is sharply separated from some other cognition or blends insensibly with that other. In respect to definiteness and clearness, presentative knowledge is the superior, for representative knowledge carries with it a vast collection of partially integrated, ill-defined cognitions associated together into a mass whose parts are full of confused suggestion not easily bounded or confined. Some representative cognitions, however, are definite, as the recollection, for instance, of a familiar face; likewise some presentative cognitions are very indefinite, as the cognition of an organic feeling of discomfort; but on the whole the rule prevails as stated.

§ 10. Inasmuch as knowledge is a growth from relative simplicity to complexity, the most natural division of cognitions is one based upon relative complexity; but since presentative and representative cognition are so inextricably involved with each other in fact, separating the two in classification is no easy matter. In truth, the separation must be somewhat arbitrary, and lines, if drawn at all, must be drawn with only an approximate correctness. Rough groupings may be made, however, of cognitions both presentative and representative according to the degree of their complexity, and such groupings may be serviceable, though liable to frequent revision and change of boundaries.

§ 11. Presentative cognitions then may be divided, according to complexity, into five grades or degrees, as follows:—

Presentative Cognitions of the First Degree.—Those cognitions in which the mind is occupied with localising upon the body a single sensation, as a burn on the hand or a beam of light on the eye. In these cognitions the representative element is at its minimum.

Presentative Cognitions of the Second Degree.—Those cognitions wherein the mind cognises a plurality of sensations, localising them upon the body, as when one cognises simultaneous pains in two different points of the body, or when one cognises a body by its touch and smell together, having reference still to the localisation of the sensations. In these cognitions the representative element is more prominent, for to cognise two things as co-existent the mind is obliged to represent one of them in contemplating the

other, turning from one to the other alternately; this alternate representation is in addition to the continuous representation in the case of each object by which that object as single is kept before the mind.

Presentative Cognitions of the Third Degree.—Those cognitions in which the mind cognises a single object in its unity as something external to the mind and apart from its sensational effect upon the organism. These cognitions are the ordinary objects of perception taken singly, as a tree, a house, a block of wood, a leaf, and so forth; they are the presentative-representative cognitions of Mr. Spencer, in which the mind is supplying all the time more or less from past experience. In viewing a brick we see only three sides of it perhaps, the other three being concealed from view; these latter we supply from our representative knowledge. Our perceptions of solidity, distance and direction in given instances are of this degree. The representative element is here quite conspicuous.

Presentative Cognitions of the Fourth Degree.—Those cognitions whereby the mind cognises a plurality of objects as external to the mind, as when, for instance, I look from my window and see a row of houses, several trees, a church tower, fences, arbours, vines, red and grey clouds. Our presentative cognitions of the external world generally range in this degree.

Presentative Cognitions of the Fifth Degree.—Ideas of the mind cognised as ideas or mental phenomena. Here presentative cognition and representative cognition seem to meet, the same cognition having both a presentative side and a representative. The connection of presentative and representative cognition in this manner is not precisely the same as in the case of sensations cognised; there is something superadded. In the latter case the presentative cognition, namely the sensation cognised, is sustained and kept before the mind as a whole by a continuous representation of the preceding presentation, but the representative cognition is not the same with, but different from, the presentative cognition—an idea which goes alongside of the sensation. In the case of an idea not directly connected with a sensation there is a closer union of component parts, so that the *same phenomenon* seems both representative and presentative—presentative as a present mental phenomenon, and representative as the medium through which a past phenomenon is recalled. In sensations occur presentative cognition and representative in

alternation or running side by side; in ideas we have all that there is in sensations and a mediate cognition besides.

§ 12. Representative cognitions may be divided in like manner into six grades or degrees, to wit:—

Representative Cognitions of the First Degree.—Those cognitions which are representations of a single item of presentative cognition considered as a whole, as the recollection of a picture, a face, a feature, a flower, a leaf, a sound, a specific pleasure or pain.

Representative Cognitions of the Second Degree.—Those cognitions which are representative of a plurality of items of representative cognition considered as wholes; as the recognition of the several parts of a picture or of several pictures, of trees, houses, fences, events, or trains of events which actually have been experienced.

Representative Cognitions of the Third Degree.—Those cognitions which are combinations of parts and wholes of presentative cognition so as to present recognitions not, as wholes, reproductions of any exactly correspondent whole of experience, but in which the constituent parts can still be traced definitely to their sources in experience, as in cognising a particular man with a particular horse's head, or in placing a particular tree we have seen in a valley upon a neighbouring mountain, or in transferring mentally and combining different parts of different landscapes, or making in the mind a different arrangement of the objects in a room.

Representative Cognitions of the Fourth Degree.—Those cognitions which are combinations of parts and wholes of presentative and representative cognitions, such as form general and abstract notions of which the constituent parts do not represent any assignable whole of experience, and cannot as a rule be traced definitely to their sources. These cognitions are expressed in their various sub-degrees of complexity by general and abstract names—*man, tree, house, dog, truth, virtue, justice.*

Representative Cognitions of the Fifth Degree.—Those cognitions which are combinations and associations of notions in couples with reference to their agreement and difference; as when on seeing an object it is recognised and classed under the general notion *tree*, or when on cognising a given act it is pronounced virtuous or vicious. This class includes judgments and the products of reasoning.

Representative Cognitions of the Sixth Degree.—Those cogni-

tions which are a complex of all or most of the preceding classes, as in the most elaborate products of imagination. We have a cognition of this grade in the picture of a city whose foundations are precious stones—jasper, sapphire, chalcedony, emerald, &c., whose gates are pearl and whose streets are gold, of which I am a resident, or my brother or wife, and in which all the dwellers are perfectly happy and virtuous, where there is perfect freedom and order, where God reigns and of which He is the light.

§ 13. These remarks upon the respective characteristics of Presentative and Representative knowledge may thus be summed up:—

1. Presentative and representative cognition exist together; neither is found by itself alone in experience; that which is called presentative is only relatively presentative; that which is called representative is only relatively representative.

2. Presentative cognition does not exist as a product, strictly speaking; as soon as it passes into a product at the command of the mind it becomes representative. Nevertheless, through the power of representation we can retain, recall, and classify it by itself.

3. Presentative cognitions are relatively vivid; representative, relatively faint. Presentative, as presentative, are immediate; representative as such are mediate. Presentative cognitions are relatively simple, representative are relatively complex. In presentative cognitions the continuing impression is the primary object of cognition, the representative element is secondary; in representative cognition the past impression is the primary object, the present continuing idea is secondary. Presentative cognitions are commonly held as original, representative as derivative; in a qualified and limited sense this is correct. Presentative cognitions may be either sensational or ideal; representative cognitions are ideal only. Presentative knowledge is in general more clear and definite; representative generally more obscure and indefinite.

4. Presentative and representative cognitions may be grouped in classes, but roughly and without very definite and certain lines of divisions. The most natural classification is according to complexity. By this standard five degrees of relatively increasing complexity may be made of presentative cognitions and six of representative. These are susceptible of very minute subdivisions.

As far back as the eleventh century the Schoolmen observed a distinction to which, though its consequence was overlooked for a period, philosophy has returned, and upon which as fundamental and indispensable the science of knowledge grounds itself—the distinction between the knowledge of a thing present as it is present (*cognitio rei praesentis ut praesens est*) and the knowledge of a thing not as it is present (*cognitio rei non ut praesens est*); a distinction so important that, in the language of Sir William Hamilton, without it 'the whole philosophy of knowledge must remain involved in ambiguities.'

PRESENTATIVE AND REPRESENTATIVE FEELINGS.

§ 14. The division according to degree of representativeness which is made of cognitions obtains also among feelings; and the ability to treat feelings as products depends upon the fact of their representation; without the latter there would be no more continuity of feeling than in similar case there could be of cognition. It must not fail to come within our notice, however, that the index of feeling is cognition. We do not *feel* an experience to be representative; we *know* it. In treating of feelings therefore as representative we are in truth dealing with representative cognitions; and in speaking of a representative feeling we mean the feeling accompanying a representative cognition. Accordingly, it appears that feelings are susceptible of division as to the degree of representativeness into the same classes and subclasses as are cognitions. There may be representative feelings and presentative feelings, the former of various degrees and the latter also. It is not necessary to repeat the divisions.

§ 15. While the foregoing remarks, implying a dependence of feeling on cognition in some degree, are true, it is none the less true that cognition is dependent upon feeling. As it has been many times urged, the two are different phases of the same thing. A presentative cognition implies a presentative feeling, a representative cognition a feeling which is representative. But feeling as such is not a subject of science; that is to say, feeling is not knowledge; when we know a thing we do not cognise a feeling, but we have a cognition; that is, what we know of feelings are cognitions of feelings. We only make feelings amenable to scientific description, definition and division in connection with cognitions accompanying them.

§ 16. From these considerations it will be sufficiently plain that the products of feeling are the feelings accompanying representative cognitions, and which are believed to be representations of former feelings. Certain cognitions are associated, and with the associations thereof are associations of the feelings attending those cognitions; these develop associated feelings whose tendency to recur and whose susceptibility to recall give them a permanent character as products. We must study the products of feeling as arising and existing in the same manner as products of cognition. Through cognition we are able to observe feelings, to trace their rise and subsidence, to learn their strength or weakness, their permanency and recoverability.

§ 17. There arises here a barrier to our knowledge somewhat similar to that which we reach in analysing cognition and in trying to understand what representation is. The obstacle in the former case is no more impassable than in the present one. We are concerned here with the very important inquiry—How can we know feeling? We have a certain experience. It is not an experience unless we cognise it; we cognise that we feel it. Unless we have such a cognition we have no consciousness, no experience. But the feeling is not the cognition nor the cognition the feeling; each excludes the other. If we cognise the feeling the latter becomes a cognition. Where is there left any feeling at all? If we do not cognise the feeling there is no feeling, and if we do cognise it, there ceases to be feeling as well. I see no way out of this difficulty; the same trouble subsists between cognition and volition. We do not will save as we know that we will, and if we cognise a volition it becomes a cognition. If we say we can feel that we will, in like manner our volition becomes a feeling. The contradiction so far as I can see must always remain unexplained and inexplicable. All that can be laid down is that there are three ultimate classes of mental phenomena, which mutually exclude each other and which nevertheless postulate each other; whose union and connection is not analysable, and in regard to whose essence nothing is known. They can be made separate objects of thought, but even then imply each other and are not independent.

§ 18. The chief value of the classification of feelings according to their degree of representativeness is in observing the growth and progress of mind, in studying its genesis, in marking the stage of advancement at which it has arrived and in predicting its

future. There are other groupings to which we more generally have occasion to refer mental phenomena and which are consequences of particular associations, and though less general and contemplating a narrower field of view are more usable in practice than the one now before us. Nevertheless as a scientific foundation for a thorough comprehension of mental phenomena, the division into the presentative and representative, carried out to whatever degree of minuteness may be advisable, is an indispensable one.

ORIGINAL AND REPRODUCED VOLITIONS.

§ 19. The same difference which has been observed with respect to cognitions and feelings in regard to their representativeness obtains also among volitions. There is a broadly marked distinction between the original and the reproduced. No volition involving choice is absolutely original, but as compared with others some are relatively so. And here the same remark is to be made as was expressed with reference to feelings; the only index of volition is cognition. We *know* that a volition is reproduced. That is to say, we have a representative cognition of the volition. Our science of volitions is a collection of representative cognitions respecting volition. The going forth of simple spontaneous energy is the beginning of volition; but it is not all of volition. There is in addition a selective process, a choice. This selection follows the instruction of pleasure and pain, and the latter in turn are dependent on cognition. As we represent the experience which gave us pleasure, we represent (though in fainter degree) the pleasure we felt, and also the volition we had to continue the pleasure: when we recall a painful experience in like manner we reproduce the pain and the movement of the will away from it. As we remember our suffering and again feel it in representation our will moves us to get rid of the pain; as we remember our pleasure and again taste it our volition moves toward the things giving delight. As representation and association go on we are all the time choosing out and seeking that which gives pleasure and avoiding that which has given pain. Selective movement, therefore, arises and keeps along with representation.

§ 20. In reality, however, as has also been remarked, volition is just as primary and ultimate as cognition. Cognition depends on volition, or on the putting forth of energy which lies at the foundation of volition, just as much as volition depends on cogni-

tion. All three—cognition, feeling, and volition—are original and indecomposable mental experiences, or they are different sides of each mental experience.

§ 21. But if, as seems to be the case, we trace volitions through cognitions, we cognise how volitions in a science of volition follow in the track of representativeness of cognition. As lines of association are formed and cognitions are reproduced, so also the accompanying volitions are reproduced; so that following the classifications of cognitions and feelings, we classify volitions as reproduced, as they recur in an increasing scale of complexity.

§ 22. The products, then, of volition considered by themselves are nothing but reproduced volitions; and as association goes on in certain directions, so volitions follow along certain lines cumulatively and gather strength with each repetition, growing more and more apt to recur. Reproduced over and over again, taken with their associated feelings and cognitions, they become on the volitional side, Governing Purposes.

§ 23. We should not forget in this connection the difficulty, to which allusion has been just made in a former section, respecting our ability to know a volition. How we know a volition seems to be an insoluble mystery; equally inexplicable is the connection of feeling and volition.

CHAPTER XXXVIII.

INTUITION AND INFERENCE.

INTUITION.

§ 1. THE meaning of the term Intuition and the scope and limits of the mental capabilities represented thereby have long been unsettled in philosophical speculation. Of so much importance has the name become that its adjective characterises a distinct (or supposed distinct) school in philosophy, whose members claim a proper extension of the denomination beyond what is allowed by their antagonists. With almost all Intuitionalists the name Intuition covers much more than their opponents allow that it can include; in what respects they make such an extension we

shall subsequently see. The applications of the term Inference have not been subject to so much doubt and uncertainty as have those of Intuition, though, indeed, it should be said that the fundamental facts of inferential knowledge are not yet so completely laid bare as to leave nothing further for the explorer to do. Intuition and Inference usually are contrasted with each other as being two separate and antithetical modes of mental experience. Intuition is generally referred to as primary and fundamental, while Inference is accounted secondary and superstructive. But as far as one has been made dependent upon the other, mankind has been disposed to measure Inference by Intuition rather than Intuition by Inference. Intuition has been regarded as a source of or method of obtaining transcendental, pure, and trustworthy knowledge; while Inference has been esteemed to yield only experiential, mixed, and uncertain information. Intuition is thus held to be the more important, partly because the knowledge it gives is considered to be primary and partly because that knowledge is deemed more clear and certain. Another and very potent reason for the *empressement* with which Intuition has been treated lies in the fact that men have been alive to the convenience of possessing a standard superior to and independent of Inference, to which they might appeal when bias or interest called for the establishment of a point and inferential processes failed to yield the desired results. Deeming it a matter of importance, therefore, to ascertain, if possible, the true significations of these words, and to analyse the mental acts, states, or products for which they stand, we will devote some pages to such a task.

§ 2. Upon one thing in regard to intuition the philosophers have been almost universally agreed, namely, that we do cognise by intuition the phenomena of the external world and the phenomena of our own minds. Whether in seeing a tree we cognise anything more than the phenomenal qualities, and if we do whether we cognise intuitively or inferentially, are questions in regard to which there has been dispute, and which are not altogether easy of settlement; but as to the phenomena there is no question and can be none, save in the misunderstandings of people who, like Dr. Johnson, think they are refuting Berkeley by kicking a stone. Nobody has been found, I believe, to set forth that we know phenomena otherwise than by intuition. Accordingly in this investigation of the meaning of the term and the sources and nature of the power, we may take our departure from this point, looking for the

essential import of the name in that to which by universal consent it is correctly applied, and leaving for subsequent elucidation the extent and confines of its proper employment.

§ 3. Etymologically considered, the word Intuition means a *beholding*, and it usually has been construed to designate an *immediate beholding*. This immediacy of cognition seems to be the essential character of an intuition. There is nothing intervening between the cognising mind and the object of cognition; the mind looks directly upon that object. I move my arm: I am conscious directly of the movement. Something strikes my foot: I cognise the pain immediately. A ray of light reaches my eye: I apprehend the colour without any intervening medium. I close my eyes and reflect; I remember what happened yesterday: that there is a mental action I am aware immediately; in having an idea I know that I have an idea, at once and indubitably. All these are instances of presentative phenomenal cognitions; thus out of the fact in regard to which all thinkers are consentient we obtain for Intuition both illustration and definition. It is perhaps allowable to assume here that the immediacy is the essence of the term in all cases where the cognitions though not presentative are claimed to be and are called intuitive. It is said, for instance, that we know Being intuitively, meaning that we know it in the clearest and completest manner in which we know anything, that is to say, immediately. For we know what we know intuitively 'without the intervention of any other idea;' and, to quote further the words of Locke—'this kind of knowledge is the clearest and most certain that human frailty is capable of. This part of knowledge is irresistible, and like bright sunshine forces itself immediately to be perceived as soon as ever the mind turns that way; and leaves no room for hesitation, doubt, or examination, but the mind is presently filled with the clear light of it. 'Tis on this intuition that depends all the certainty and evidence of all our knowledge, which certainly every one finds to be so great that he cannot imagine, and therefore not require a greater.'[1] If then it be allowed (and it will hardly be disputed) that by *intuitive* is meant 'the clearest and most certain' knowledge, and that such knowledge is the clearest and most certain as is cognised 'without the intervention of any other idea,' immediateness may be accepted as a criterion of intuitive cognition, and intuition may be defined as 'immediate beholding.' It is hence apparent that the question

[1] Locke's *Essay concerning Human Understanding*, Bk. IV. Chap. II. Sec. 1.

to be settled in a given case of doubt as to whether anything is an intuition or not, is simply whether the given object is cognised immediately or mediately: if the former the cognition is intuitive, if the latter it is not intuitive.

§ 4. What cognitions, then, are immediate? At least all cognitions so far forth as they are presentative: if such are not immediate, no cognitions are immediate, and the word is destitute of meaning. In discussing representative cognitions it has been noticed that they have in a marked degree both a presentative and a representative side. In their presentative aspect, they are ideas as phenomena irrespective of their signification; as representative, they are reproductions of former experience known as such. I think of a rose seen yesterday and not now present: this idea of a rose is a presentative experience in so far as it is a mere mental phenomenon; that I have this idea I cognise immediately; but in so far as I cognise the idea as a representation of yesterday's experience, the cognition is representative, and such a cognition of the prior experience is effected through the medium of the present idea. In representative cognition, therefore, so far forth as it is representative, we must be said to re-cognise a fact through the intervention of a present idea. Representative cognition is hence mediate.

§ 5. In the distinction between presentative and representative knowledge lies the entire difference between immediate and mediate cognition, and thus between intuitions and those cognitions which are not intuitive. Just here lies the solution of the whole difficulty in which metaphysics has been involved over intuitive and non-intuitive knowledge. It is the neglect of this distinction and the want of a sufficient understanding of the growth of representative cognition, its differentiations and redintegrations, that has led men to such contradictory and confused notions of the meaning of intuition. It is attention to this difference and careful association of intuition with presentative knowledge and non-intuition with representative, that will alone keep the mind free from confusion upon this topic. To the extent that a cognition is presentative, it is intuitive; in the degree that it is representative, it is not intuitive. In order to make this truth plainer, and to support it, we will now review the different degrees of presentative and representative cognitions in greater detail, and after such an examination we shall be able, as there arises occasion, to note the aberrations of philosophers on the subject, seeing how

and where they have departed from the narrow path, adherence to which (in my judgment) can alone save the traveller from becoming entangled in a pathless maze.

§ 6. But a word is needed in this place in regard to the co-ordinate subject of this chapter. If inference be opposed to intuition, so that the two exclude each other, the former must be separated from presentative cognition and ranked with representative. And this seems presumptively the proper course to take. Certainly when we infer a thing we do not behold it immediately, but mediately; and when we intuite any object we do not infer anything so far as we intuite it. Inference may take place collaterally, but that which is intuition is outside and exclusive of whatever inference there may be. Yet we are not at present prepared to say that inference is co-extensive with representative cognition; for though it appears that every inference is mediate cognition it is not yet evident that every mediate cognition is an inference.

§ 7. Leaving the subject of inference, however, for subsequent treatment, let us now examine some intuitions and so-called intuitions. It will readily be admitted that cognition is almost wholly intuitive in the lowest grade of presentative cognition, wherein the mind occupies itself with localising on the body a single sensation, as a burn on the hand. The sensation of the pain in the member is apprehended intellectually by intuition; the representative element is least evident. But even in these simplest intuitions the question meets us—What is it we immediately behold? If it be replied that we intuite the sensation, it is necessary to know what is the sensation. So far as it is feeling, we feel it, so far as it is cognition, and subject to analysis, we may ascertain the elements of which the cognition is composed. In the last chapter but one it has been found that every act of knowing (and believing as well) involves certain fundamental relations present and cognised; the relations of which we are conscious are *Agreement*, *Difference*, *Time*, *Representation*, and *Power*, these names being general expressions to designate the relations cognised in every act of knowing. We have an intuition of things involving these relations. We do not immediately cognise agreement in general, difference in general, time in general, and so forth, but we behold intuitively an object presented as the same with itself, as different from another beside it, as continuing, and as succeeding or preceding another. By analysis we discover these general and funda-

mental constituents of every cognition; that is, we discover them by reflection, which is to say, mediately. What we intuite is in each case certain sensations cognised by ourselves. In each individual experience we have an intuition of something agreeing with something, something differing from something, something represented, something continuing, and something succeeding something, while in the consciousness of *something* we have also what has been termed *consciousness of power*, active and passive; but the expressions by which we describe these experiences mark generalisations which are not intuitive.

§ 8. It must not escape attention that there exists also from the very dawn of consciousness, even in the cognitions most characteristically presentative, an element of representation which is not immediate. Every item of conscious experience requires representation in order that there may be any continuity of experience. Hence there are no unmixed intuitions; intuition is succeeded by representation and the converse. Intuitive cognitions alone would be like flashes of lightning in the night, for a moment illuminating, but after an instant going out, and leaving only thick darkness. Where the representative constituent is less prominent than the presentative the cognition may be called prevailingly intuitive, but in all cases there is an element not intuitive.

§ 9. Since in all cognition there is a discrimination between self and not-self, between the phenomena of mind and not-mind, it follows that at every instant of conscious experience we intuite a difference between the Ego and the Non-Ego. It is important that the character of this intuition be not misunderstood. In describing an intuition we are forced to use language which marks a cognition not immediate but mediate; we can only treat of immediate cognitions by mediate ones; we can know that we have presentative experience only by representative cognition. The cognition signified by the term Ego embraces a series of experiences terminating at the present moment; equally so the cognition made manifest by the name Non-Ego. If we speak of knowing the Ego and the Non-Ego by intuition, we shall be almost certain to err unless we keep in mind this fact. We do not know by intuition that the Ego of to-day is the Ego of yesterday, nor that the Ego of yesterday is different from the Non-Ego of to-day, nor that the Ego of yesterday is different from the Non-Ego of yesterday; for such knowledge is dependent

upon representation. We merely cognise intuitively at each successive moment of time, so small as to be definitely inappreciable, that I (Ego) *am* other than Non-Ego. In no way different is the discrimination intuitively made between the phenomena which connect directly with the external world and those which appertain exclusively or concurrently to mind. Whatever intuitions we have of space, matter, force, time, and motion, are intuitions only of space, matter, force, time, and motion, as in and composing each external object or phenomenon we cognise. From moment to moment we have intuitions, presentative experiences, which representation discovers to involve these relations. We have no intuition of space in general, force in general, motion in general, but only intuitions of something extended, something resisting, something moving. We shall have occasion to refer to these cognitions of space, force, motion, etc., in a subsequent paragraph, and till then we will dismiss them from consideration.

§ 10. We now pass to a higher grade of presentative cognitions, namely, those in which a plurality of sensation is distinguished and localised upon the body. How far do we cognise intuitively the prick of a pin upon the hand and the simultaneous impact of a stone or block of wood upon the foot, supposing that neither of the two sensations is so intense as to overpower the other, nor so faint as to be unheeded in the presence of the other? The answer to this question is implicated in the reply to be given to the more general query—What is co-existence? The answer to the latter interrogation is perhaps not yet to be considered settled. It has been claimed that co-existence is but a form of succession. In such a view a cognition made up of two simultaneous sensations would have in its composition a larger amount of representation than where a single sensation is cognised. For, in order to sustain the two together, a representative cognition must alternate with a presentative in very close succession: while sensation A is present sensation B must be represented in association, and while sensation B is occupying present attention there must be a mental reproduction of sensation A in contiguity therewith; the mind passes from A to B and from B to A, giving specific present attention to each in turn and losing sight of neither. In the cognition of co-existent phenomena there is accordingly an additional grain of representation over the preceding case, and hence a less amount of intuition. But if, on the other hand, it finally be made evident, as I believe, that co-existence is not resolvable ultimately

into succession, but that the mind actually and literally can apprehend two things at the same time, the intuition involved in the cognition of co-existent sensations would be of precisely the same character and in precisely the same degree as in the inferior grade (in complexity) of presentative cognitions which was noticed in paragraphs just preceding; the amount of representation relatively to the amount of presentation would be the same in both instances.

§ 11. A still more complex degree of cognition occurs in the perception of external objects. In viewing a book lying on the table I do not see the under side of it at all, yet I am perfectly well assured that if I turn the book on the edge I should see something substantially like what I now see. I have an intuition of the upper surface, but I mentally complete the book by reproducing my past experience of the structure and form of books. When therefore I say I intuite a book before me (if such a verb may be formed), I do not speak correctly. The proportion of representation in the cognition is not so large as when I think of a book, none being before me; yet it is considerably larger than when I apprehend a pain in my head, or a pain in my head and the pleasurable odour of a rose co-existently or successively. Therefore, in perceiving whole objects in nature, I cognise a portion immediately, and with this immediate cognition I cognise another part mediately. Perception of objects is hence partially intuition and partially not intuition. Of course, where there is a plurality of objects cognised, there is an increase of complexity in the cognition, but the relative proportion of immediate and mediate cognition remains about the same; at any rate, whatever difference there may be is not of a sufficiently distinctive character, in kind, to need more particular explanation.

§ 12. In the case of ideas considered as mental phenomena irrespective of their representative aspect, the same line of observation may be pursued. Every such cognition is immediate or mediate according as it is viewed; there is a sort of double consciousness which has not been resolved into anything more ultimate—so to speak, a consciousness of presentation and a consciousness of representation. But even when we are regarding an idea simply as a phenomenon, the peculiarity must be noted that even on the presentative side there is also representation, else the idea could not continue as an idea, but would be evanescent and incognisable.

§ 13. Having now run over the different ranks of presentative cognitions, let us turn to those characteristically representative, in order that we may have opportunity to see in greater detail what cognitions cannot in any sense be said to be intuitions. The simplest representative cognitions need not detain us long. Recollections of events or trains of events, appearances or collections of appearances, are not intuitive. In remembering a man whom I met on the street the other day, in recalling the features of a landscape I saw last summer, in reviewing the scenes of my school-days, in reproducing in idea as well as I am able the pains of a fit of sickness or the delights of a concert or spectacle, I have no intuition, but only a mediate cognition of the past experience. These things are matters of remembrance or recollection; nobody claims that the name intuition is applicable to them (excepting always the consideration of these cognitions simply as ideas).

§ 14. Representative cognitions, wherein parts of experiences are transposed and transferred from one connection to another, but so preserved in their integrity as to be traceable and recognisable, exemplify a higher degree of complexity in cognition, but exhibit nothing essentially different from the last case as regards the points now under consideration. There may be in my room a bust of Washington and one of Lincoln, and I can very readily imagine the Washington head on the Lincoln shoulders, or *vice versâ*. It is evident, however, in my mind that the head I put on Lincoln's shoulders in idea is a representation of the head which I have seen on the Washington bust. I simply make a constructive junction of two mediate cognitions. There is no intuition, but the intuition of an idea of a bust made up as aforesaid. In all the varieties of representative cognitions thus far noticed, there is no disagreement among philosophers as to the fact that the cognitions are not intuitive.

§ 15. Advancing a little further in the course of the elaboration of knowledge, we meet with combinations of parts and wholes of experience into new wholes, forming what are known as general and abstract notions. These may occur alone or in couples, which unite cognitions of varying generalities in judgments. As to the character of general and abstract notions, there have existed wide differences of opinion. Some thinkers have considered them to be intuitions *par eminence*, while admitting their generality and abstractness; others have denominated some particular cognitions of this class intuitions, while they have

denied the name to the fellows of these cognitions. Correspondingly, those judgments which express general knowledge have often been called intuitive, and it seems as if the higher and more far-reaching the generality the more confidently the term has been applied. In fact, nearly all cognition whatever reaching in complexity beyond that characterised in the last paragraph, has at some time and by some one been dubbed intuitional. But all those cognitions which are marked by general and abstract names, even those indicated by the names Being, Time, Space, Substance, Motion, Power, Force, The Infinite, The Absolute, The Beautiful, The True, The Good, and the like, are reached by abstraction and generalisation; they are thus representative, hence mediate, hence not intuitive. This conclusion, however, does not determine whether or not they are innate, necessary, or universal. That such cognitions have been held intuitive is owing to the fact that thinkers have failed to apprehend the difference (or to keep it before them) of an act of present apprehension and the results of remembering, connecting, abstracting from, and generalising such acts; also to the fact that thinkers, from a hazy, mystical habit of thought, from the fear of consequences to some of their prejudices, and from a want of careful observation and profound analysis, have been led to assume the existence of a super-sensible undefined faculty of the mind to see by 'the mind's eye' what they have crudely imagined ought to be seen, or what they would like to have seen.

§ 16. We may be asked here what disposition is to be made of axioms? *The whole is greater than a part; Two straight lines cannot enclose a space; If equals are added to equals the sums will be equal*, will be cited. The answer to be given to such queries is that axioms are generalisations or expressive of generalisations. If the first proposition were *This whole now before me is greater than its part*, we might consider that the cognition represented by the phrase was intuitive, but as the axiom stands (and if it were not in that form it would not be an axiom), the meaning is not the whole before me, but all wholes that I have ever seen or shall see, all wholes in fact that anybody has seen or can conceive of. Now, without discussing the origin of such cognitions as are called axiomatic, it may at least be asserted generally that our cognition of their truth is not a matter of knowledge but of belief. We *believe* that all wholes are and will be found to be greater than their parts. We associate together in thought a

number of wholes. But association and belief are not allied to immediate cognition; belief is always mediate cognition. Similar observations may be made of the other axioms mentioned; also of any others that might be mentioned. They are generalisations from experiences which are intuitive, but are not themselves the experiences. To call them intuitions is to confound important distinctions of knowledge, and work confusion.

§ 17. Dismissing the axioms, it may be observed that in comparing objects and referring them to classes, or in cognising objects as comprehended under classes, as when we say *Trees are green*, *Apples are sweet and sour*, *Man is mortal*, the predicates are always highly representative and the subjects may be so. The prevailing character of the cognition is thus representative and mediate, and the knowledge as a product is mediate. Here we shall probably have no one to contradict us. And much more is such a characterisation applicable to chains of reasoning, as syllogisms. Reasoning is held by all to be mediate cognition. But in passing to the highest grade of representative cognitions, wherein general notions and particular cognitions are combined in forms making highly complex wholes which have no correspondent reality, in maintaining that intuition is absent except as to the ideas considered as phenomena, we might again encounter opposition from those esteeming that man has a 'reason' or 'intellectual intuition.' Many think their visions are revelations of a reality transcending experience. Some religious enthusiasts would claim that their imaginative flights in the portrayal of the glories of God's kingdom are intuitive cognitions of supermundane realities. Such descriptions as those given in the Apocalypse of St. John might be cited as examples. Whether or not there may be realities of which the luxuriant imagery of the Book of Revelation is symbolical, is a question open to debate, but it is perfectly obvious that, though as wholes these descriptions do not raise cognitions corresponding to experience, they are composed of elements which experience affords. The parts of the pictures are parts of remembered experiences; the terms used to describe the wholes have primary reference to experience, and derive their meaning from experience. The representative character of such cognitions thus appears plainly enough, and while it may be possible that what they imagine may *become* presentative, that they *are* immediate cognitions of realities, seen intuitively, cannot soberly be maintained for an instant.

§ 18. Having now reviewed the several classes of cognitions, we have seen what are intuitions and what are not intuitions; and while no cognition is wholly intuition we have observed in what ones the intuitive character is sufficiently prevailing to warrant applying the name *intuition* to the whole. The poet says that 'Knowledge is of things we see.'[1] In these words, when properly interpreted, there is the soundest philosophy. I know of no more important reform required in the use of terms as affecting thought than the restoration of the words *intuition* and *intuitive* to their proper and original signification. It is a reform imperatively demanded. Unless they can be rescued from such uses as they are made to subserve when they designate general notions, they had better be discarded altogether. Undoubtedly some will contend, while conceding the primitive meaning of *intuition* and *intuitive* to be what is here set forth, that after all in practical use the words have become so modified as to make them the most suitable for expressing all fundamental truth. When a word has acquired a fixed signification, even though that be quite a different one from its earlier denotation or connotation, it is often better, these people would say, to accept the situation than to try to restore what has been lost. Often, but not always—and while remark of this kind would be quite true in many cases, it is nevertheless not pertinent to the present one. If no reform were made, but the evil practice of which I am complaining were to become universal, there would still be need of a distinction to be drawn between presentative knowledge and that of representation, and the application of the term *immediate* to presentative knowledge would be likely still to continue. Unless then it can be restricted to presentative knowledge an entanglement of meanings is inevitable, for we could scarcely divest *intuition* of its meaning of immediateness. We should all the time, therefore, be confusing presentative with representative knowledge: but the distinction between the two lies at the foundation of all scientific classification of products of the intellect, and to obliterate it or confuse it is to destroy or confuse the very science of knowledge. It would be far easier hence to confine the words in question to their obvious and primary meaning than otherwise to avoid the confusion and trouble sure to result from extending them beyond this sphere of application. It is certainly worth our while, therefore, to endeavour to suppress the illegitimate employ-

[1] Tennyson's *In Memoriam*.

ment of which I have spoken. It may be suspected that men—not understanding the nature of belief and not regarding belief as conveying certitude equally with knowledge, feeling that there are certain truths necessary and universal, and apprehending also that presentative cognition is vivid, certain and indisputable—have, in order to convey and secure the impression that those necessary truths are equally vivid and certain, appropriated the terms *intuitive* and *intuition* from their reference to presentative knowledge, to characterise the others. If, however, the mind can be led to see that we may be as certain of what we believe as of what we know, and that a truth may be necessary and universal without being intuitive, we shall perhaps find it less of a task to persuade people to relegate the name *intuition* and its kindred adjective to their original and only justifiable use of designating cognitions which are characteristically presentative.

INFERENCE.

§ 19. There has never been that uncertainty and confusion in the use of the term Inference which has prevailed in the case of its companion, Intuition. There never has been serious dissent from the explanation that an inference is a proposition which is received as true in consequence of the admitted truth of some other proposition. To explore and make evident the psychological processes which constitute the act of inference is, however, a work which has not been thoroughly carried out. As a consequence it happens that the scope of the term has been rather too restricted than too greatly enlarged, and we shall not find error in the way of its improper application so much as in the failure to embrace within it much that there belongs. It will be for us to study here the nature and character of the mental process which makes inference, and see what is concerned in the act of inferring.

§ 20. Our task is somewhat simplified by our ability at the outset to dismiss peremptorily the whole general division of presentative cognitions from our consideration. Intuitions are not inferences. What is apprehended presentatively, in common parlance, we *know*; we do not *infer* it. In every presentative experience there is indeed a representative element which is not intuition; but in saying that intuition is not inference I do not mean to include that constituent: *so far forth* as a cognition is

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presentative it is not inferential. We are hence to seek for inferences in the other grand division of cognitions. Inference must be representative cognition of some sort. Is all representative cognition inference, and are the terms convertible?

§ 21. In answer to this question another may be asked, namely, whether if we were called upon to characterise representative cognition to distinguish it from any other kind, we should not invariably denominate it inferential. We have already noted the difficulties in the way of designating it as intuitional, and there seems to be a naturalness and fitness in terming such knowledge inferential. It behoves us, therefore, to examine the grounds of the appropriateness of such a designation. The matter will be elucidated by the examination of some representative cognition, as that of a picture I saw yesterday. On a recollection of it I have a cognition in my mind of which, as being present, I am conscious. Besides the consciousness of the present cognition, I know that it represents an experience I had yesterday. My mind is, so to speak, carried back to the past experience which I *infer* that I had. By the medium of a present idea the mind is carried back or over to the past sensation. The expression 'mind is carried back' is indeed figurative, but there is no other which indicates better the character of a representation. Representation itself is unanalysable; we only know that this cognition in our minds is a second presentation, a re-presentation. The idea of a picture is not that picture, but is a copy, as it were, of the picture and known to be such. In representing the picture the mind *refers* the present idea to a past sensation which it *infers*. It cannot be said that the one is carried back any more than the other is brought forward; the process is wholly beyond the reach of further analysis. All that can be said is, it is different from immediate beholding.

§ 22. With the representation of a cognition there will be certain judgments involved. The picture is represented, and with the representation I judge that I saw it, that it existed, etc. These judgments are all inferential; the existence in the past of what we remember is inferred by virtue of our remembering, and, in proportion as our memory of the circumstance is strong or weak, the inference is to us conclusive or inconclusive. We infer that we had certain sensations, and infer the existence in the past of objects which afforded such sensations. So plain and distinctive

a case of representation as that of representation of a sensation thus carries with it inference as a part of the experience, and, in fact, as constituting the same. If we take away the representative cognition, there is no inferring; if we subduct the inference, either there is no cognition at all or it becomes intuitional.

§ 23. Now since the instances wherein we find the purest representation reveal inference as an essential part of the cognition, and since all cognition which is not representative is immediate or presentative, from which latter inference is always distinguished, it would seem to be clear that the act of inferring is neither more nor less than representative-cognising. Nothing more is needed to confirm this conclusion than to see whether in the progress of knowledge, in the ratio in which the representative element varies, the character of the knowledge is correspondingly inferential. The earlier parts of this chapter and the expositions in the two preceding chapters tend to make out this latter. The complexity of cognitions depends upon their degree of representativeness; and only in this complexity do we find any call for inference. We cognise through media when we infer, and the less complex and less highly integrated those media the less inference and reasoning are conspicuous. But the media through which we cognise are representative cognitions in different stages of integration. And given a power of representation and the process of association psychologists have shown how all reasoning is explicable. Both Mr. Bain and Mr. Spencer, as well as the two Mills, have fully developed this branch of mental activity. The process of association is not another kind of knowing but a part of the process of cognition itself, and of the growth, accumulation, and integration of cognitions. From all these considerations, therefore, we are pointed to the inevitable conclusion that inference as a mental process is identical with representative cognition.

§ 24. For still further confirmation, let us dwell for a moment upon two or three examples of representative cognitions which might at first thought seem to be in no sense inferences. For example, the phrase *I had a father* would appear to be the statement of a fact, and not at all inferential. It is certainly true, the popular mind might say, that I had a father; there is no doubt of it; the expression is moreover an independent statement, not an inference from any other. In response, it should first be said that the truth or falsity, the certainty or doubt, attending a proposition do not depend upon the absence of inference; what we

infer may be as true and as certain as what we intuite. I infer that, if all men are mortals, some men are mortals, and this latter conclusion is not more doubtful than my intuition of the light—indeed some would claim the certitude of the latter to be inferior. In the second place, let us see whether, even if there are no explicit premisses for the assertion, there are not some implicit. The cognition expressed by the proposition *I had a father* is a complex one, made up of sundry minor ones. Father expresses the fact of paternity, a general notion derived from various experiences. Certain events are observed to follow certain other events; an association of two individuals of opposite sex, fecundation, conception, and birth follow each other in regular sequence; we generally infer sexual intercourse from the parties living together; fecundation and conception as consequences are wholly matters of inference; so also birth as following therefrom is inferential. Now that these same processes are gone through with in the cases of all human beings is inferred from a universal experience, or one so general and uncontradicted as to warrant the inference that it is universal. Thus that all human beings have fathers is an inference. Moreover, that I am a human being is also an inference derived from a comparison of myself with others I see about me; that I existed yesterday or in any past time is also an inference from my memory. Accordingly we observe that the proposition *I had a father* is a conclusion from a number of implicit premisses, themselves matters of inference. The cognition, therefore, expresses a series of inferences which are involved in its meaning and without which it would have no signification whatever. It is itself an inference from the premisses just set forth. Even so simple a recollection as *I went to London* is made up of inferences. That there is a place called *London* is an inference from common testimony; that I visited a certain town on a particular occasion I infer from a remembrance of a set of occurrences to me; that this town is the one called *London* I infer from testimony likewise.

§ 25. Again, take a cognition which is not expressly a judgment. It will be asked, what possible inference is there about the notion marked by the name *house*? This is the name of a single notion formed by the representation of a number of particular experiences generalised. It cannot be called an inference (some will say), and its presence in the mind is not evidence of a process of inference. Yet I think a little reflection will convince one that this cognition is not attainable without a series of inferences. In

the cognition there is a conscious representation of experiences; the general notion is one representative of particular sensations had by me in time past; there are implied judgments at least that I had such sensations, and in this case of the existence of objects causing those sensations; but, as has been already remarked, these latter are inferential judgments. So that in the cognition of a *house*, were we to take away the judgments of past experience and existence, there would be no cognition present at all; and the presence of that cognition involves and requires these inferences. In representing *house*, I infer that I have seen houses and that they existed, and these inferences are a necessary part of the cognition. Here, as elsewhere, the act of representative cognising is an act of inferring. Equally is this true of other general notions. The word *white* stands for a cognition of some particular white thing which is a representation of or resembles something I have seen; also the co-ordinate cognition that there are numerous objects which agree with this in being white;—both of these cognitions are inferential.

§ 26. Once more, the comparison of a present object with an absent one, so far as representation is involved, demands inference. All identifications require inference unless the objects identified are all present, and even then inference is not dispensed with, for we are obliged to infer that the objects remain the same from moment to moment. If I say *This is a horse*, there is a degree of inference not difficult to trace. I infer that the image I have in mind of the characteristics of horses had a reality corresponding to the object now before me, agrees with or is like a large number of other objects I have seen and other men have seen; those other objects are not present, and unless I can infer the likeness and that such objects have existence or had it, I am not entitled to say *This is a horse*. Again, therefore, we see that so far as a cognition requires for its explanation the power of representation, it requires inference.

§ 27. Further illustration may be found in going over carefully the objects of belief, as has been done in a recent chapter. We in every case see that wherever there is belief, there is inference. In the examples immediately antecedent we have examined some of these cases, and it is hardly necessary to review in detail all cases of belief. They substantially embrace beliefs in existences and events which have been experiences to me or some one else, or which may become such experiences. That there have been any

existences or events within my experience or within the experience of any one, is inferential (as has been explained); so also is the belief that anything may be expected to come within the experience of any person. But it will be remembered that the acts of representative cognition and belief we discovered to be the same; therefore, we again make an identification of inference and representative cognition.

§ 28. If the analysis thus far made be correct, there are sundry corollaries which may follow whose importance is considerable, and which when expressed make still clearer the truth of what has been stated in regard to inference. Referring now to the fact previously brought out, that representative cognition while distinguishable from presentative does not exist without the latter; that every cognition, every item of knowledge as a product, requires both presentation and representation; that consciousness itself would become unconscious were it not for both,— it will appear that inference is an ultimate and primordial act of mind and involved in all cognition. It is unanalysable, and itself a prime factor in consciousness.

§ 29. Still further, it appears that the psychological processes of belief and inference are the same, and that the attributes of the one may be ascribed to the other. For in the preceding chapter we learned the correspondence between belief and representative cognition, and observed that what could be attributed to the one of those two could be attributed to the other. We have thus made out three operations to be essentially the same, namely representative cognition, belief, and inference; the one is not present without the others; representative cognition would not be such without belief and inference, belief would not be belief in the absence of representative cognition and inference, inference is not inference at all without representative cognition and belief. But while, therefore, these three terms refer to the same mental operation, they are nevertheless each applicable to somewhat different phases of it. Representative cognition is the generic term applicable to an act of representative apprehension, as such, irrespective of relations and expressions: *House, tree, I had a father, I lived in Boston, Trees have foliage, Men are mortal*, alike mark representative cognitions. When an agreement or disagreement between two distinct cognitions is apprehended, if the resultant cognition is prevailingly representative, it is, when expressed, a belief. The name Belief when applied to an expressed product

of cognition is attached to a proposition; when applied to the cognitive operation, itself, it is a judgment, not a single notion. *I lived last week; I shall be living in ten years; London is the largest city of England; Balthasar Gerard assassinated William the Silent; Men are mortal*, are propositions which are distinctively expressive of belief. When, instead of one judgment made without dwelling upon its antecedents or consequents, there occur two or more following each other, the mind passing from one to the other with a dependence of the consequent upon the antecedent, we denominate the consequential judgment with reference to the other an Inference: *I lived last week (for I remember sensations occurring to me then); I shall be living in ten years (for men generally live to the age I shall have then reached); London is the largest city of England (as trustworthy authorities have stated); Balthasar Gerard assassinated William the Silent (for the concurrent word of many historians may be relied upon); Men are mortal (since universal experience has been that men have not lived beyond a certain maximum of years)*—all these are inferences from the judgments expressed by the propositions in parentheses, or others similar to them. Every proposition, consequently, which is characteristically representative may be regarded either as the expression of belief or of inference from implicit premisses. The word Inference, however, as characterising a proposition, is usually restricted to a conclusion from premisses found in the discourse in which the proposition occurs, and some of which at least are explicit and the others readily suggested by the context.

§ 30. If there should arise in the mind of any one at this point a question why the mind cognises a dependence of one cognition upon another, the answer would be that this is explained by the laws of association and representation. There are countless representative cognitions passing through the mind between which no relation of dependence exists; we do not say we infer one from the other. If I were to say, *Men are mortal, therefore dogs have tails*—we should hardly be justified in calling either cognition an inference from the other. I might nevertheless connect these two facts in thought so as to infer one from the other, and though that would not make the inference a valid one, it would still be truly an inference. If I should for any reason come to establish a firm association between these two facts, so that when one was suggested the other should follow it, it would thus be

entirely possible for me to infer one from the other. In this way all inferences are created and sustained. If there be a sufficiently strong association the established connection will govern the transfer of the mind from one link to another. Representative cognition explains the act of inferring; the laws of association and representation show how particular inferences come to be made and to exist in the manner in which they do.

§ 31. The elaboration of inferences in the mind takes place most conspicuously and chiefly through association. Where the mind passes directly from one object to a second, identifying the one with the other, the process is commonly spoken of as Immediate Inference; where it arrives at its conclusion only through the intervention of a third or mediate object, the proceeding is denominated Mediate Inference. Although these distinctions have been very generally made in treatises on logic, I conceive them to be highly objectionable, for all inference, as we have seen, is mediate, that termed immediate being only relatively so—relatively simple and direct as compared with the other. If there be occasion, a distinction may be made and preserved in terms like Simple Inference and Complex Inference, indicating a difference in complexity, but no distinction should be allowed as to the nature of the process. The process of immediate inference is precisely the same as that of mediate inference, and both of them are mediate. In the first case, A suggests its similar B, the two are compared directly and an agreement cognised between them. Now agreement means that in so far as two objects agree they are identical, and one may be substituted for the other. Power of substitution is the very essence of agreement, though logicians have not always noted the truth. To Professor Jevons the world is much indebted for the first explicit and complete enunciation of this doctrine ('Substitution of Similars' and 'Principles of Science'). If then an agreement be cognised between A and B so that $A = B$, that $B = A$ is not another cognition but a different expression of the same cognition. The mind through the presentative ideas *a* and *b* infers the equality of A and B the objects. Thenceforth A and B are associated and one may be substituted for the other, as regards quantity; the cognition instead of being $\boxed{A}$ and $\boxed{B}$ becomes $\boxed{A|B}$ and $\boxed{B|A}$. Thus far so-called Immediate Inference. If now $\boxed{B}$ has been found equal to $\boxed{C}$, instead of our thinking simply $B = C$, the association of B at once arises in the mind and we think $\boxed{A|B} = \boxed{C|C}$ or unite the cogni-

tions in groups like the following, $\boxed{B \mid C}$ $\boxed{A \mid B \mid C}$ $\boxed{A \mid C}$ $\boxed{C \mid A}$, etc.; that is A = B, B = C ∴ A = C. We have, as it were, a double of B compared with C. What is affirmed in quantity of B may be affirmed of its other self its substitute A. The three objects $\boxed{A}$ $\boxed{B}$ and $\boxed{C}$ are brought together in the mind, and a link of connection is forged between them all; what may be affirmed of A (we are now speaking of quantity) may be affirmed of B and C; what may be affirmed of B may be affirmed of A and C; and what may be affirmed of C may be affirmed of A and B. This is the first step in Mediate Inference. In the two cases, the one of immediate and the other of mediate inference, there is no difference in the kind of the process, but only a difference in the complexity and the length of the movement. When C is finally brought into the mind, its being equal to A is just as immediate an inference as that A = B; the mediateness consists in the fact that B was first necessary in order to suggest C—that the mind starting from A went to B and through B brought up C for identification with A. In an extended series of mediate cognitions, the process is one of repeated identifications, and a gathering together and carrying along all that have previously been gained to the next new case; this is more laborious, and when the end of the course has been reached the process appears longer, and, so far as we can determine, is longer than if the inference were an immediate one; but each new inference made in the process is just as much immediate and no more so than the inference A = B ∴ B = A. Mediate inference, then, is only a series of immediate inferences, and immediate inferences are mediate or representative cognitions. I *believe* that A (object) = B and B = A, or through the ideas $a = b$, $b = a$, I *infer* that A = B; this is the simplest step in inference. By the same cognition I infer B = A; this is the second step. I then carry along A and B as equals to C, and identify C with A and B simultaneously, by the same cognition pronouncing that C = B and C = A; this is the third step. The first of these steps is representative cognition; the second is so-called immediate inference; the third is so-called mediate inference—all of them are but different degrees of representative cognition.

§ 32. When by so-called mediate inference, which I should prefer to call *discursion*, A is found equal to C, the intervening link B may come to be discarded altogether. This operation is all the time going on in mental experience. Truths are reached by a discursion through other truths, and then the middle truth is

dropped out of consideration (except perhaps in analysing the steps by which we arrive at the conclusion). Identifications are first made through suggesting media, and afterwards are directly apprehended. For instance, experience has established the truth that rattlesnakes are poisonous. I see a certain snake different from any I have ever seen before, but which, from reading and information acquired *vivâ voce*, I esteem to be a rattlesnake. I then infer the reptile before me to be poisonous. There is thus established an association between a reptile of a certain appearance and the attribute poisonous; so that the next time I see a snake of that peculiar appearance I infer it to be poisonous without necessarily first considering that it is a rattlesnake. In truth, what is termed mediate inference occurs only where knowledge is partially integrated. When we are reasoning we are feeling our way to knowledge, or are confirming, establishing, and explicating knowledge; when we have settled the points about which we reason, and have laid out the results, we infer directly and necessarily according to our established associations, and what before has been the conclusion of a discursion in thought passes into the category of uncontradicted and even necessary truth.

§ 33. Having now shown to the best of my ability the nature, sources, and more rudimental developments of inference, I have done all that is contemplated for this chapter. Our examination has gone far enough to illustrate the psychological character and place of Inference, its connection with, and at the same time its opposition to, Intuition. To show that other minds have run in somewhat the same channel as my own, regarding inference, I shall take the liberty of quoting (though without stopping to criticise), as bearing upon the subject and the views here maintained thereon, two or three sentences from a noteworthy article in the St. Louis 'Journal of Speculative Philosophy,' by C. S. Peirce (Vol. II., pp. 140, 154) and a passage from the treatise on Logic in the 'Encyclopædia Britannica,' both of which will be seen to harmonise substantially with this exposition, and may be esteemed corroborative in some degree of the correctness of the positions here taken. Says the former: 'All mental action is reducible to the form of valid inference.' 'The association of ideas consists in this, that a judgment occasions another judgment of which it is the sign. Now this is nothing less nor more than inference.' 'Inference is only a transition from one cognition to another.' The writer in the 'Encyclopædia' remarks:—'Logic

evolves not laws which govern any one fact of mediate thinking taken singly, but relations between two or more such facts or laws which govern the derivation of one such fact from another or others. That which logic scrutinises is not one fact of thought, but a process constituted by a plurality of such facts. It considers thinking as knowledge or cognition, that is as having objects which are truths, but it assumes and systematises those laws only in virtue of which, one or more facts of knowledge being given, other facts of knowledge may be elicited from them. . . . Psychologically or subjectively considered, discursive thought exhibits no distinctive characteristics beyond those which belong to it as being necessarily mediate or representative. It is always resolvable into a series of judgments. Its peculiarity lies in the relation between the constitutive judgments; it is a relation in which the objective side is the more prominent of the two. We might say, indeed, that the relation subsists not between the acts of judging but between the judgments; not between one mental fact and another but between their several results or products.'

§ 34. Single terms, names, and words are not usually held as standing for inferences; that all the cognitions indicated by these symbols involve inferential cognition, however, may be repeated. The proper sphere of inference is judgment, and, as the writer in the last quotation seems to imply, not single judgment, but the relations between judgments. A proposition then is the characteristic expression of an inference. On the other hand single terms rather than propositions are the most appropriate expressions of intuitions. Probably the words indicating the purest intuitions are the exclamations as *ah! oh!* The personal pronouns as *I*, *thou*, *he*, and the demonstratives *this*, *that* frequently designate primarily an intuition; concrete names applied to an individual present, or a present experience, as *John*, *house*, *fire*, *cold*, are symbols of intuition. General names as such are marks of cognitions characteristically inferential; abstract names do not stand for intuitions at all. It is hardly proper to call any proposition intuitive. Even so simple and apparently immediate cognition as that expressed by *A is A* is as much inferential as intuitive—indeed, more so, for it depends for its validity upon the prior proposition *A is*. *A is A* is an inference meaning, *So long as A is*, *A is A*. The thought *I exist* is intuition mixed with inference; for existence is general in its meaning, and hence representative. I only intuite that *I am I* by the prior cognition *I was I* at various

preceding moments: while as a proposition, *I exist* stands for a presentative mixed with a representative cognition. Of course propositions imply intuition, but if we call them intuitions we are led into difficulty by the necessity of using the very same propositions as inferences. If we say *A is A*, standing for an intuitional cognition, is itself properly to be called an intuition, or that its prevailing character in general is intuition, we are met by such cases of its use as the one above taken, *A is A, for A is*. Evidently in this latter use *A is A* is an inference and inferential. Similarly, every proposition may point primarily either to an intuitive or an inferential act of the mind, according to circumstances. Inasmuch, however, as propositions for the most part convey general knowledge and are highly representative, if they were as a class to be characterised by either of the two terms before us, the adjective *inferential* would be the more fitting. Most propositions can at once be shown to be inferences from implicit premisses. Language derives its value from the fact that it is general and common. Its office is to preserve and communicate, but this requires that it shall stand for representative cognitions. The meaning of a word is its general connotation, its representative character. A pure intuition cannot be expressed at all by language, any more than it can be found alone in mental experience.

§ 35. We are now prepared for a brief summary to fix more clearly in mind the results attained in this chapter.

1. Intuition is a cognitive act of immediate beholding, Inference is a cognitive act of mediate beholding. Intuition corresponds with presentative and Inference with representative cognition; the two are antithetical and mutually exclusive.

2. Both Intuition and Inference are present in every act of cognition, varying as presentative and representative cognitions vary. No cognition is purely intuitive or inferential, but the prevailing character may be one or the other; a cognition may be relatively intuitive or relatively inferential. If either intuition or inference were wholly absent, there would be no cognition at all but an absence of consciousness. Both are ultimate and unanalysable mental operations.

3. Inferring and believing are the same cognitive act, both being phases of representative cognition. In believing, the mind dwells upon two cognitions seen to agree or differ, without considering attentively the relations of those two cognitions to any-

thing save each other. In inferring, the mind usually connects two pairs of cognitions and cognises a relation of agreement in difference between them. Every representative cognition may be viewed as a belief or as an inference; every belief may be regarded as an inference, and every inference as a belief.

4. The formation and establishment of particular inferences as permanent products is the work of association and representation. The simplest and most direct inference lies in the cognition of identity or similarity between two objects, the essence of the agreement being the cognition of interchangeability between the two, so that one may be substituted for the other. As other associations are joined this process is repeated, and the mind advances discursively from one cognition to the other, carrying over to the conclusion what is in the premisses. As associations become more firmly established and many connections are made, intermediate links are dropped and inference direct assumes the place of discursive inference: the latter is characteristic of the acquiring, confirming, and arranging of knowledge; the former occurs as a perfected result of the associating processes.

5. Intuition is more characteristically expressed by single terms, inferences by propositions; no language, however, stands exclusively for either, but all language indicates both, since in every cognition the two are inextricably involved. In discourse, nevertheless, those propositions are commonly called inferences which are connected in dependence upon other propositions, the whole indicating a passage of the mind from one to the other in the relation of dependent and principal; with such the science of logic deals.

Dugald Stewart in a most remarkable and instructive passage ('Philosophy of the Human Mind,' Part II., Ch. II.) has, I think, approached more nearly than any other before his time (save perhaps Locke), and more nearly than the most who have since lived and written, to the true solution of the problems concerning the nature and connection of the intuitive and ratiocinative powers of the mind. Stewart saw the intimate connection of intuition and inference, though from their constant presence together he erroneously considered that there was no radical difference between them, and though he did not clearly and distinctly apprehend in their details the complete operation of the laws of association and of the representative powers in the production of all varieties of reasoning.

CHAPTER XXXIX.

PERCEPTIVE REDINTEGRATION—PERCEPTION.

§ 1. It is never the case in an exposition of the development of conscious states that we can find one process or set of processes working alone. All mental operations are so involved with each other that an account of one is never complete and hardly possible without an account of sundry complementary operations. In studying knowledge we are forced to consider belief, in examining presentative we are obliged to deal with representative cognitions and the converse; in order to understand intuition we are compelled to study inference. Therefore in following out some of the more prominent lines of redintegration in serial order, we shall have great difficulty, as we take up each one, in excluding the others. We cannot wholly exclude them, but nevertheless there is a possibility of segregating mental phenomena in which a particular process or a similarity of results is prominent, and considering for a while the likenesses of operation, of object, or of products, by themselves; ignoring to a great extent all but that we choose to make the conspicuous object of attention. In this way one of the first lines of redintegration which we are called on to pursue is that ordinarily characterised by the term *Perception.*

§ 2. Perception is intuition. That is to say, it is presentative cognition. The cognition may be sensational or ideal, but so far forth as the act of knowledge relates to the object present it is a perception. The presentative cognition of an idea as an idea is a perception, though a representative cognition may also be involved. Hence, there has been preserved a somewhat objectionable distinction between External and Internal Perception, the former relating to phenomena of the external world presented as sensations, the latter to the phenomena of consciousness as objects of cognition. But since the latter are representations of the former, the process of cognising them in the two cases is in no wise different. The chief difference is that of relative definiteness and vividness of the experiences.

§ 3. Perception is always of objects as Non-Ego, of *things* as cognised by a self not those things, but excluded from them and

set over against them. Moreover, perception is of objects in various relations. These objects are wholes, integers formed by association, and distinguished from each other by differences.

PERCEPTION OF THE EXTERNAL WORLD.

§ 4. The primitive integers formed in perceptive redintegration are those of perceived impressions of the same sensibility; and the most primitive of all are the perceptions of muscular impression. These are distinguished among themselves by differences in extensiveness of surface affected, in intensity of the impression and subjectively in the relative continuance of it. The earliest experiences of contact therefore present objects in space-relations, and force-relations, and with reference to the subject in time-relations also. Add to these the relations of likeness and difference which determine the integrations themselves, and we shall have the material of human perception of an external world.

§ 5. The groups of sensations which we noticed in Part IV. all have their counterparts as objects of perception. The sensations of touch, hearing, and sight, we found, give the most definite intellectual experiences; those of taste and smell, with the systemic sensations, the least definite. Hence as perceptions the former are of much greater importance and fill a larger part of cognitive life than the latter, since with increasing and increased definiteness goes enhanced aptitude for representation.

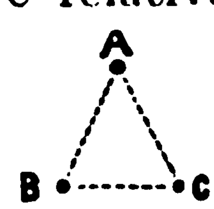
§ 6. A plurality of impressions, more or less congruous, and a sequence of objects in close contiguity, with the aid of the associating and representing processes, produce integers by the connection of impressions through different senses. Also by representation many past impressions are recalled and have their influence upon the present act of perception. Therefore perception in the individual's experience speedily comes to involve very complex redintegrations, and through inherited predispositions likewise is materially affected by ancestral experience.

§ 7. We need not again enumerate as objects of perception the separate classes which we marked off in treating of the genesis of feelings. What we are now called upon to do is to indicate some of the relations subsisting between the objects presented through sensation and to trace the development of the more complex perceptions; and in this work we shall find illustrated the truth of what has been before asserted, that though perception is in itself

intuitional, all perception involves and carries with it a full complement of inferential knowledge.

§ 8. The various perceived attributes of material objects may be classed either as statical, statico-dynamical, or dynamical (Chap. XIV. § 7). The first of these comprise relations of bulk, figure and position, and are originally perceived by muscular and tactile contact. They are the fundamental experiences of motion and resistance. The perception of relations of position is acquired by an alternation of sensations of resistance and non-resistance. While the resistance continues uniform, the intellectual powers perceive an object as a unit; when the resistance is vacated and after an interval another resisting object is perceived, the former object is represented, and a relation is established between the two and the perceiving subject. So also when a resistance is experienced at two distinguishable points upon the sensitive surface, the same connection is made between the two and the perceiving subject. In either case this connection is nothing else but a representation of a moving body passing between the two points where motion is suppressed. The measure of the position of the objects perceived is the continuance of the sensation of motion. It is clear that the perception of position must take place with the earliest cognitive experience. For that experience arises as an experience of alternating motion and resistance, and the resistance implies two co-existing objects in contact.

§ 9. The perception of position-relations carries with it the perception of distance, that is, the interval between two resisting points measured by the continuance of the motion of a third resisting body. Hence two points are separated from each other by a greater or less distance relatively to the perceiving subject. In the contiguous diagram



A B and C have relations of position to each other, A being the perceiving subject. There are three resisting bodies at rest, *placed* at certain distances from each other. These distances are determined by the length of time it would take a moving body having a given rate of velocity to pass between the points.

§ 10. The perception of direction is closely connected with that of distance, and, like distance, is involved with the relations of position. It arises with the cognition of motion to one of a

plurality of points, movement to the others being also possible. A point is so located that a given movement will reach it; it is then said to be in the line of that movement, or in a given *direction*. There are as many directions possible as there are distinguishable movements in lines from the perceiving subject or from the object which is made the standard. Movements of the limbs probably give rise to the earliest perceptions of direction.

§ 11. We next note the collocations of positions into bulk and figure. Definitions we have already given show how this is accomplished in experience (Chap. XII. § 16). To repeat what has been before said—the collocations of separable resisting bodies in the midst of spaces give magnitudes linear, superficial, and solid, lengths, breadths, and thicknesses. A line is the limitation of extension by co-existent positions of resisting body taken consecutively between the terminal points. A surface is the limitation of extension by co-existent positions taken between three or more intersecting lines. A solid is the limitation of extension by co-existent positions taken between four or more intersecting surfaces. The defining lines and surfaces of a body give its figure. Curved lines are made up of straight lines with varying positions with respect to each other. All of these perceptions imply distance measured by muscular movement. In the perception of a solid we have resisting surfaces separated by a greater or less distance. We arrive at the complete perception of solidity when we can encompass a body with the fingers, the hands, or the arms. A surface we can readily distinguish when the nerves of touch reveal a plurality of points, as in the case of moving the fingers or the outstretched hand. Variations in the quantities of these sensations of movement and resistance and in their combinations give the varieties of bulk, figure, and position which we perceive in the external world. We do not always have these sensations complete; but association and representation supply nothing else than these very experiences of motion and resistance. Touch and muscular pressure are competent to give perceptions of all varieties of position, magnitude, and figure, and where they are not applied representation and association refer to them as the ultimate measure. If a person had no other senses than touch and muscular contact, he would have complete perceptions of the statical attributes of material objects, though those perceptions would be limited in number and in complexity.

§ 12. Sensations of smell do not afford perceptions of statical

attributes, except distance and direction, and of these alone by association, the variations in the presentative experience being only in respect to intensity. These latter differences aid us, to be sure, in determining locality, but they do this by means of experiences which the mind has had previously of certain degrees of intensity of odour connected with a certain body at a certain distance or in a given direction. By association all sorts of attributes may be suggested in connection with odours, but the perception through smell itself is dynamical and not statical. This last remark may be made of perceptions of taste; but here the sensations are mingled with tactile sensations which the mind defines by perceptions of statical attributes of the object upon the tongue. However, in this case, the proper taste sensations do not supervene till magnitude, figure, and position begin to be eliminated by dissolution of the thing tasted. So long as it remains undissolved, our perception is of an object of a certain magnitude and figure situated in the mouth or pressing against the tongue; as fast as it is dissolved the experience changes from perception of statical to that of dynamical attributes.

§ 13. The organic sensations do not give (save by association) perceptions of magnitude, figure, or position. Neither do the sensations of hearing. Distance and direction are determined by sounds, but wholly according to their degree of intensity. The same sound, experience teaches us, is feebler as it is more remote and stronger as it is nearer. In ascertaining direction the combined action of the two ears is an important aid. 'The concurrence of the greatest possible effect on the right ear with the least on the left ear is a token that the sound is on our right hand; an equal effect on both ears shows it to be before or behind. At best the sense of direction of sounds is not delicate [ordinarily speaking]: we cannot easily find out a skylark in the air from its note; nor can we tell the precise spot of a noise in a large apartment.'[1]

§ 14. Cognition of the external world is very largely effected by sight. And yet sight plays, after all, only a secondary part in perception. The characteristic sensibility of sight is colour. In perception the distance, position, figure, and size of objects are essential particulars, involving extension generally. We have just seen that extension in all its modes can be cognised, through our muscular and tactual sensations. A person born blind cognises the statical attributes of objects. We now inquire what

[1] Bain's *Mental Science*, p. 56.

statical attributes, if any, can be perceived by the eye? The sensations of sight are produced by impacts of light (and abatements of the same) upon minute separable points of the nerves of the eye (Chap. XXVI. § 49). There is a perception of contiguous points of resistance, both in sequence and co-existence. Hence these sensations give rise to perceptions of linear and superficial extension. In its reactive influence the eye is able to move along the flame of the impinging object, thus measuring the same within the limits of the ocular motion in similar manner to measurement by the hand of an extended surface.

§ 15. The location of objects at a distance from the perceiving subject is still further a perception dependent on motion and resistance. There is presented to the eye a continual change of objects about us. Our eyes adapt themselves to the varying circumstances; they adjust themselves and readjust themselves as objects grow nearer or more remote; the retinal magnitudes change; and the pictures presented are diverse. These distinct ocular experiences become associated with a definite amount or degree of locomotive or arm-movement energy; so that when an object is seen the necessary adjustment of the eye, the magnitude of the object call up into association the corresponding experience of movement and enable us to determine the distance without actually measuring it with the arm or walking over it. Yet under the most favourable circumstances and after the greatest amount of training the eye can only estimate distance roughly. In order to determine distance with accuracy, appeal must be had to measurement, that is, the distance must have been actually settled by reference to muscular motion. Were the eyesight anything more than a substitute for movement made available by association and representation, we should not need to resort in this manner to measurement. Moreover, we must not lose sight of the fact that the changes in the adjustment of the eye occurring with varying distances, together with the varying retinal images, are themselves experiences of movement. The feelings attendant upon these adjustments are not the same as the visual sensations, but are feelings of automatic movement which are associated with movements of the limbs, and thus made indicators of distances. The same remarks as to movement and association of movements may be made with regard to linear extension in any degree; and if to extension in one direction, also to extension in all directions.

§ 16. From the foregoing facts it appears that the primitive

statical perceptions of vision are of superficial areas having relations of positions coexistent and consecutive. But even these perceptions are of little avail unless supplemented by associations of tactual and muscular perceptions, which latter the others symbolise and to which as fundamental they are constantly referred. And so far as the perception of solidity is concerned, it does not seem possible to reach by means of visual sensations alone, since it involves measures of distance which can be apprehended only by reference to muscular sensations. How, in fact, the notion of solidity arises upon perception by the eye we shall in a moment consider.

§ 17. There exist four elements of association in perception through the eye: (1) The ocular adjustment for seeing an object; (2) The extent of the image on the retina; (3) The distance; (4) The true magnitude of the object. The ocular adjustment and the retinal image vary with the distance. When an object is brought nearer the eye, the magnitude of the retinal image increases, and the inclination of the optic axes required to cause the pictures to fall on corresponding places of the retinæ, becomes greater; the divergence of the rays of light proceeding from each point of the object and which determines the adaptation of the eyes to distinct vision of that point; and the dissimilarity of the two pictures projected on the retinæ becomes greater. All these occur as varying experiences to be associated together. It has been found, through experiments made by Sir C. Wheatstone with a modification of the reflecting stereoscope, by which the convergence of the eyes upon a picture can be changed while the distance remains the same, and the distance be changed while the convergence remains the same, that the distance remaining constant, greater convergence makes an object seem smaller. That is, while the retinal magnitude remains the same, greater convergence gives a perception of smaller size. Furthermore, leaving the convergence unchanged, and bringing the pictures nearer, thereby increasing the size of the picture upon the retina, there is a perception of increased size in the object. The perceived magnitude of an object, therefore, diminishes as the inclination of the axes becomes greater, while the distance remains the same; and it increases when the inclination of the axes remains the same while the distance diminishes. When both these conditions vary inversely, as they do in ordinary vision when the distance of an object changes, the perceived magnitude remains the same. Thus

as regards the perception or appreciation of the real magnitudes of objects seen by the eye, the association lies between a certain magnitude (ascertained by other means than sight) and a certain inclination of the optic axes with a given size of the picture on the retina.

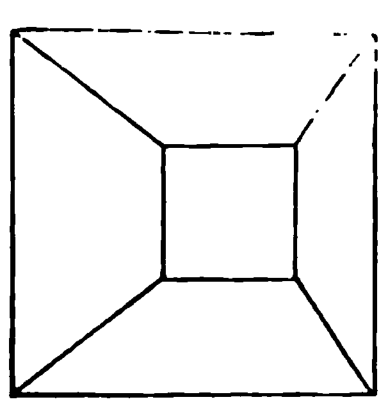
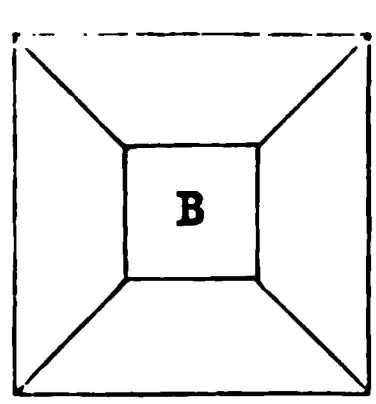
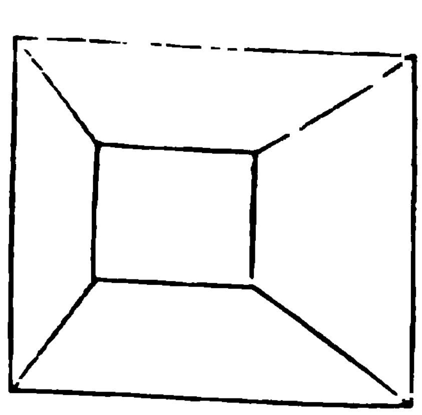
The figure of a man of which we have a certain muscular estimate by our movements and previous experience, when viewed at some one inclination of the optic axes, yields an image on the retina of a particular size; and with such inclination and size of image we then associate the muscular appreciation of an object six feet high, etc. The concurrence of these two conditions always suggests a similar magnitude or extent of the thing viewed. And if the optic inclination is made smaller, that is, if the axes of the eyes approach nearer to parallelism, while at the same time the image on the retina is correspondingly less, as by removing the object to a greater distance, there will still be a perception of the same size, or the same muscular appreciation will be suggested to the mind. We have an association of the size of a man with a great many different combinations of those two circumstances, produced by variation of actual distance.

Sir C. Wheatstone's investigations led him to consider that the appreciation of distance, instead of preceding the estimate of magnitude, follows it. To him it appeared that the sensation connected with the convergence of the axes suggests proximately a correction of the retinal magnitude to agree with the real magnitude, and that distance instead of being a simple perception is a judgment arising from a comparison of the retinal and perceived magnitudes. Distance associates itself more firmly with the retinal magnitude than with optical inclination. When an object recedes from our view, the change of distance makes itself evident more through the diminishing size of the retinal picture than through the approach of the optic axes to parallelism. Allowing this, the process of association is as follows: The inclination of the axes, together with a given retinal picture associated with experiences of magnitude acquired through the muscular sensibility, suggest the magnitude; and from the true magnitude thus known and the retinal magnitude, we infer the distance.[1] This explanation, so far as the perception of distance as subsequent to that of size is concerned, is contrary to the ordinary view, the latter being that we perceive the apparent size, then by variations

[1] See Bain's *Senses and Intellect*; Intellect, Chap. I.

of convergence in the visual axes, assisted by representation and association, we determine the distance, from which we infer the real magnitude, as we have already seen.

§ 18. Binocular vision is of great value in enabling us to perceive the statical attributes of bodies. This appears especially with respect to the visual perception of solidity. This arises from the conjoined action of two dissimilar views of an object presented to the two eyes in such a manner as to give the impression that one part of the object is farther off than another, but that the parts are continuous. 'When we look at a small circle, all parts of the circle are at the same distance from us, all parts are equally distinct at the same time, whether we look at it with one eye or with two eyes. When, on the other hand, we look at a sphere the various parts of which are at different distances from us, a sense of the accommodation, but much more a sense of the binocular adjustment, of the convergence or the opposite of the two eyes, required to make the various parts successively distinct, makes us aware that the various parts of the sphere are unequally distant; and from that we form a judgment of its solidity. As with distance of objects, so with solidity, which is at bottom a matter of distance of the parts of an object, we can form a judgment with one eye alone; but our ideas become much more exact and trustworthy when two eyes are used. And we are much assisted by the effects produced by the reflection of light from the various surfaces of a solid object, so much so that raised surfaces may be made to appear depressed or *vice versâ*, and flat surfaces either raised or depressed by appropriate arrangements of shadings and shadow.

L  B  R 

'Binocular vision, moreover, affords us a means of judging of the solidity of objects, inasmuch as the image of any solid object which falls on the right eye cannot be exactly like that which falls on the left, though both are combined in the single perception of the two eyes. Thus when we look at a truncated pyramid placed in the middle line before us, the image which falls on the

right eye is of the kind represented in R, while that which falls on the left eye has the form of L; yet the perception gained from the two images together corresponds to the form of which B is the projection. Whenever we thus combine in one perception two dissimilar images, one of the one and the other of the other eye, we judge that the object giving rise to the images is solid.'[1]

§ 19. The perception of direction is an association of an optical effect with sensations of movement. It appears most likely that the line of visible direction is a line passing from the place of an object's impression on the retina through the centre of the crystalline lens; hence we associate an effect on the centre of the retina with a direction in the line of the axis of the eye, while an impression to the right of this point would suggest a position left of the axis. But without the experience of muscular movement we should never know the meaning of direction, or the fact that a certain impression of the retina implied a certain course for us to take in reference to the object.

§ 20. Before passing from the topic of statical attributes and relations of objects let us devote our attention to the localisation of sensations upon and within the organic body with its relations to outside localisation. This is a matter of acquired perception. The distinctness of the nerves gives us separate impressions which we definitely associate with different parts of the body. The relative positions of the different members and the different portions of the surface are learned in the same way as external objects; they are, in fact, such objects to the mind, of which we have visual, tactual and other perceptions. When we experience a sensation independently of sight, the movements which we learn to make, to increase, retain, abate, or modify that sensation, give us a perception of its locality upon which we are accustomed to rely, though as a matter of fact the perception may be illusory. '*A sensation appears to us to be situated at the spot in which we are accustomed to meet with its usual cause or condition, and this spot is the one at which the explorations of touch are capable, by acting there, of checking or modifying the commenced sensation.*'[2] The results of the operation of this law are thus explained by the same author from whom it is quoted, and whose admirable delineation of the process of perception will be a permanent possession of psychological science: '*In the first place*, we see that

[1] Foster's *Text-book of Physiology*, Bk. III. Chap. II.
[2] Taine's *On Intelligence*, Bk. II. Chap. II.

this judgment must invariably be false; for the touch can never arrive at the sensory centres to check or modify the commenced sensation; the sensory centres are in the box of the cranium in a place our hands cannot reach. *Secondly*, we see that in most cases the localising judgment must situate the sensation somewhere near the peripheral extremity of the nerves; for, though the excitation of the whole course of the nerve is the normal antecedent of sensation, our touch can only attain the parts adjoining the peripheral extremity. It is then at this point and no other of the nervous cord that the localising judgment must situate the sensation. And this is true for all sensations, even for sensations of sight at least in the first stage of their localisation; in fact . . . persons born blind, at the moment a surgical operation restores their sight (*sic*), situate colours near the periphery of the optic nerve. It is later on, after a further apprenticeship, that they refer them beyond this to the place where the objects are situated. *Thirdly*, we see that the localising judgment cannot situate sensations at the exact spot of the periphery of the nerve in action, but in its neighbourhood, and in general a little beyond it; for the touch cannot reach the exact spot. The finger cannot reach the retina at the back of the eye, nor the pituitary membrane at the inner part of the nose, nor the acoustic nerve in the labyrinth of the ear, nor in general any nervous periphery. What it reaches are the envelopes and appendages of the nerve, the eyeball, the vestibule of the ear, the anterior chamber of the nerve, the surface of the skin. There it is that it checks and modifies the commenced sensation, or associates with it a sensation of contact. There, then, it is that we must situate the sensation, and it is the same with sensations of sight as with all the rest; persons born blind who have lately been operated on situate their new sensations at the surface of the eyeball and not at the back of the orbit. *Fourthly*, we see that in many cases the localising judgment must be vague, for there are places which touch cannot reach; for instance, the internal parts of the limbs and trunk; consequently we situate approximately and vaguely all the sensations whose starting-point is in the belly, the chest, the stomach, just as we do the partial sensations of which a total muscular sensation is composed. Numbers of strange appearances are explained in the same way. If the exploration of touch is brought to a stop by a fixed eminence like the teeth, the sensation will appear to be situated at the surface of the eminence,

though the nervous disturbance is much lower down. If the explorations of touch cannot verify the positions of the two nervous disturbances, one of which is situated above, the other below, as happens with visible objects, we shall situate in the inverse order the two sensations derived from them. In fact, images of objects are reversed upon the retina; the feet of a figure are above and the head below, and nevertheless we situate the head above and the feet below. The apparent position of our two sensations is thus found to be the inverse of the real position of the two disturbances.

'It remains to be shown how, in accordance with the same law, the localising judgment situates certain kinds of sensations beyond our nervous superficies. The fact is there are two stages, and the judgment, according to the nature of the sensation, stops at the first or goes on to the second. Two kinds of sensations, the visual and auditory, can alone pass through both stages; they alone are clearly projected from their first position to some particular spot or other of the outside world. The fact is, they alone furnish materials for an ulterior localisation. Take, for instance, two visual sensations. Not only have they a common organic condition, the modification of the open eye, but besides they have each of them a special external condition, the presence in a particular spot of the outer world of an illuminated body, a condition to which there corresponds in them some precise and notable character, according as the body is in one place or another. When by feeling with the hand or by closing the eyelids, we have proved their common organic condition, we prove by other feelings, and by changing our position, their different external conditions. We have interrupted all our visual sensations by the same act—by closing our eyelids; we interrupt our different visual sensations in different manners by extending our arm more or less, by increasing our change of position, by covering with our hand the illuminated surface of the body which emits the rays. Now these are the only differences which can interest us; for these are the only indications which direct our action; they alone suggest to us the number of steps and the extent of the movement by which, through reaching the object, we reproduce in ourselves some anterior state which was agreeable or useful to us, or by which, in removing ourselves from the object, we avoid some anterior state which was displeasing or hurtful. Our attention then is directed solely to these. The general association which had first joined our

different visual sensations to the idea of the movement by which our hand reaches our eye, is effaced as useless; the education of the eye is accomplished; useful associations become established and alone subsist. Each distinct visual sensation is combined with the idea of a distinct movement of more or less length effected in one or another direction; it takes this idea as its associate; henceforward it is inseparable from it. By this combination it becomes situated at a greater or less distance, in one place or another, but always in the outer world.

'The same reasoning applies to the place of auditory sensations. Now if these two sorts of sensations have this singular peculiarity, it is because by a special peculiarity there corresponds to each variation in the situation of their distant cause a precise variation in the sensations themselves. We . . see . . . how the precise variations of the sensation of sight are effected by the adjustment of the crystalline lens, the greater or less convergence of the two eyes, the contraction of the motor muscles of the eye. With respect to hearing, whose localisations are less exact, variations less precise, but still precise, are furnished by the greater or less intensity of the whole sensation entering both ears, and by the greater intensity of one of the two component sensations. It is not the same with the other senses. Their sensations indicate nothing, or next to nothing, as to position. For, first, a sensation of contact, of pressure, of taste is only produced when the external cause touches the skin, the mouth or the palate; at a distance this cause does not operate; this is how the sensation which it excites does not vary according to distance; the localisation remains checked at its first stage, and we situate the sensation at or near the place in which the explorations of touch meet with its organic condition. As to sensations of smell and heat in certain cases and up to a certain point, we are capable of appreciating vaguely, by the force or feebleness of the sensation, whether its origin is near or distant; sometimes we can even distinguish whether it is on our left hand or right; but it is nearly always necessary to make a new examination. When our eyes are shut, we discover by smelling about, by turning the head in different directions, that the smell comes from a bouquet placed on a particular side of us, that the cold comes from a particular chink. But we do not know this with precision and at once; the idea of a certain movement of measurement does not present itself immediately by virtue of an ancient and fixed connection and attach itself to the sensation

so as to localise it in one spot rather than another of the outer world. Consequently we remain in suspense; we are tempted to consider our sensation sometimes as a sensation, sometimes as an unknown thing which starts from without and enters us. The words *smell*, *cold*, *heat* remain ambiguous, and denote in ordinary language sometimes the one, sometimes the other; this is because the second stage of localisation has commenced and broken down. It would not break down if the nostrils were placed, like the ears, on the two opposite sides of the head, and could thus discern in a whole sensation of smell two sensations, one stronger than the other, or if there were two symmetrical, distinct, and opposed portions of the body charged to receive sensations of heat. We thus see that the same law explains both the definite and the indefinite situation we attribute to our sensations, sometimes in the neighbourhood of the peripheral extremities of the nerves, sometimes elsewhere and at a greater distance.'[1]

§ 21. The result of our experiences is that we come to attain by association and representation a visual chart of the body and its members, which is preserved as a representative object; so that when we have a certain sensation, though we may not see the point of contact of the impinging force with the organism, we form an image of the locality and its appearance, more or less definite as our education is perfect or imperfect. These visual images stand as signs for muscular movements, which are at the foundation of our perceptions of statical attributes. Equally true, in our cognition of things beyond the body, do these visual images stand as signs for muscular and tactile experiences. To resume our quotation from Taine—'We need not be surprised, then, at the enormous part played by the visual atlas in ordinary life. For our parts to recollect, to imagine, to think, is to *see* internally; and to call up the more or less enfeebled and transformed visual image of things. So, too, the word *image* is borrowed from the history of vision; strictly, it only denotes the cerebral revival of the optical sensation; it is by extension that we have applied the same name to the cerebral revival of muscular and tactile sensations, of sensations of sound, taste, and smell. By the same encroachment the visual atlas, being infinitely more extended and much more readily dealt with than the other, becomes our general resort; all our sensations are transcribed into it and find a place in it, the muscular and tactile ones with

[1] *Op. cit.*

the rest. In fact, I have internally the visual representation of my body, and even of the parts, like the back, which I have not seen: and when I contract a muscle, or undergo a contact, I localise the contraction and contact, not only by imagining the longer or shorter sensation, which would conduct my hand as far as the spot of contraction and contact, but further, and above all, by imagining the visual form and colour of the part affected. "It is on the right side, at the crown of the head, on the knee, between the bones of the left elbow." When we mentally pronounce a judgment like this, we mentally see the coloured form of the parts. This extends so far, that usually, in order to represent to ourselves the movement of the arm which would be required to measure a distance, we make use, not of muscular images, but of visual images, and represent to ourselves, not the prolonged contraction of our arm, but the coloured form of our arm passed through the air from one visual point to another. And so to estimate the distance of a sound we represent to ourselves by visual images the space which surrounds us, and situate the sonorous trembling at a particular height, in a particular direction, at a particular point of distance and proximity, in the huge field surrounding our body and traversed by the glance of the external or internal eye.'[1]

§ 22. In the perceptions we have thus far been considering, namely those of statical attributes, the object is regarded as predominantly at rest, and known to us through subjective activity. Closely connected with these are the perceptions of statico-dynamical attributes, wherein there is a cognition of action and reaction of subject and object (Chap. XIV. § 2). The perceptions of the former class are characterised by extension; they are perceptions of motion limited extensively; the latter are perceptions of motion limited intensively. In the latter, force-relations are prominent; in the former, space-relations. That the two are very firmly united in perceptions is evident. We have already discovered that our presentative experiences are, not of motion or resistance singly, but invariably of motion *and* resistance. Since wherever there is action there must be reaction, the variations in the degree of resistance experienced at once give the perception of statico-dynamical relations. These relations we have mentioned in a former part of this work (Chaps. XII., XIV., XVII.), and they are attained through sensations of touch and muscular

[1] *Op. cit.*

pressure originating from the external object and sensations of muscular tension and muscular motion originating subjectively. Among them all relations of quantity as intensive are the most prominent; though of course relations of co-existence and succession are also of account.

§ 23. As in the case of statical attributes, so also with those we are now considering, it is true that perception of them through the other senses is effected by association with touch and muscular feeling. On seeing a body we judge it to be hard or soft, tough or brittle, rough or smooth, resilient or irresilient, upon the belief that, if we touched or handled, it would be found so. And our belief is based upon prior experiences of certain appearances to the eye having been associated with certain tactual and muscular experiences. In like manner certain sounds have been associated in our experience with certain bodies of given statico-dynamical character; so also of smell, taste, and the systemic sensations.

§ 24. We have heretofore seen (Chaps. XII., XIII.) that motion is a primordial and unanalysable experience. Our perception of motion, therefore, is fundamental, and always accompanied with an alternative perception of resistance. These perceptions are originally attained through muscular experiences, though followed very closely by perceptions reached through other sensibilities. Visible movement is perceived by the change of the image upon the retina, and by the movements of the eye and its muscles; by the latter the direction of movement is measured, its duration and its velocity, also a quick movement exciting a different feeling from a slow one. From velocity thus judged, and from associations enabling us to determine mass and size by the organs of sight, we are enabled to infer the statico-dynamical attributes of bodies which we see but do not touch. In this estimate differences of colour also aid. So also sensations of hearing enable us to infer by association the same class of attributes. A particular sound is associated with a particular body; variations in this sound with differences of distance, direction, and velocity. One sound suggests a falling rock; another, rushing water; another, thunder; another, rustling leaves, and in each case with all their associations. Similarly, though with less certainty, in the case of the other senses.

§ 25. Of the measures of statico-dynamical attributes we need not speak, inasmuch as they are sufficiently familiar to every one

M M 2

who has a moderate acquaintance with the physical sciences. It is sufficient to say that they resolve themselves into measurements of relative resistances, and are ultimately referrible to muscular experiences; the standards employed being substitutes for, but still representing, those experiences.

§ 26. In the ratio that we come to experience sensations which are aroused by external agencies, to which we are not able to assign definitely statical attributes—magnitude, figure, and position—we begin to have an experience of dynamical attributes of body. Where extensive quantity is reduced to a minimum of appreciation, and intensive quantity is the only or the chief element of cognition, we perceive what are called dynamical attributes, in the perception of which the subject is relatively passive and the object active.

§ 27. The dynamical attributes of body are not only distinguished by their degrees of intensity of effect, but also according to their varying modes of presentativity. Heat, light, sound, odour, colour, taste, are names expressing some of these different modes. They are all modes of motion. Subjectively, we cognise different feelings; objectively, different forces.

§ 28. The attributes of body which I have referred to as statical are common attributes which are uniformly connected with all experiences of the external world. Size, figure, and position belong to all bodies which resist, and are thought to belong to all agencies which affect the organism from the external world, even though we cannot define them. Force is also attributed to all such agencies. But the modes in which force operates, varying according to the varying reactions of organism and environment, since they are not universal in our experience, are regarded on their objective side as contingent or conditional attributes of body; so also with the particular modes in which space-attributes are presented, and the combinations of space-attributes and force-attributes which we call statico-dynamical.

§ 29. Our perception of external objects, then, involves a union by association of various experiences, differing in all the respects which are indicated by these differences of attributes we have been considering. Some of these experiences occur together, as the touch and the taste of a morsel in the mouth, or the combinations of colour and visible extension perceived through the eye; others which are absent are represented with more or less certainty, according to the strength of association, and attributes

are hence inferred. I see on my table an apple. I infer, by association and representation, the tactile experiences of handling it, the odour and the taste. From the sight of a distant flame, I infer its heat. The sides of a solid which are concealed from my sight I believe to be the same as the side I do see, or different from it, according to circumstances. The mechanical, physical, chemical attributes of bodies we infer from present experiences, which call up associated past experiences. The guaranty of the correctness of our inferences is the uniformity of nature.

§ 30. It follows that perception is much more than cognition of presentative impressions; and hence it is true that the same presentative impression may have a totally different meaning in the minds of different individuals. The whole of a person's cognitive acquisitions determines the representations which the mind makes in connection with a given presentation or set of presentations; and the associations of one are widely different from those of another.

§ 31. The part which volition plays in perception is that of directing and controlling the attention. This latter is sometimes involuntary, and sometimes voluntary. Out of the multitudes of impressions made upon the mind through sensational channels, the power of choice exists to select some and reject others, thus to hold the attention upon those selected, and to get rid of what is displeasing. Of course, this power of choice can be educated; and by educating the attention, a high degree of perceptive discrimination may be reached.

§ 32. It remains to be observed that this special examination of the perceptive process accords with the results of our general analysis of external things (Chap. XIII.). What we perceive as in a world external to the mind is things which are related to one another and to the perceiving subject. It is then obvious that relativity, consistency, and an ability to present themselves to the perceiving subject, appertain universally, and thus necessarily, to these things perceived. Nor does it need any argument to show that extension and force, in like manner, are inevitably ascribed to the objects of perception. Though we may not be able always to define the extension attributes, yet we do cognise their force-relations; and force, as we have seen, implies motion, motion implies something occupying space, and the occupation of space implies magnitude, figure, and position of some sort or degree. Moreover, all resistance implies extension, and the expe-

rience of resistance is an essential and universal one in connection with force.

§ 33. Thus, uniform and universal experiences must needs generate inseparable associations in our perceptions of the external world, which are transmitted from one individual to another by heredity, and are developed with rapidity and certainty in the individual's experience by the processes of attention, association, and representation. Though the external world, in the operation of its multifold and multiform forces, furnishes the material for perception, after all it is the inner power of the mind's activities that gives to this material its order and meaning in consciousness.

PERCEPTION OF THE INTERNAL WORLD.

§ 34. Internal objects of perception, in the sense in which the ambiguous terms *internal* and *external* are employed with respect to this process, are *ideas*. This means that they are cognitions, to have an idea and to know that we have one being the same thing; and these cognitions, as we have seen, are presentative or representative. But the only sense in which the term *perception* can have any significance with regard to cognitions is when cognitions, as such, are made the objects of attention, that is, when the mind acts reflectively. Hence, so-called internal perception has to deal only with representative cognitions on their presentative side. And since these cognitions are subject to all the laws of redintegration, those intuitions which we are now considering are ideal integers formed by associations effected through the past and present actions and reactions of organism and environment. Internal perception is the cognition of states of consciousness and their relations; the processes involved are simply those of redintegration; and hence we need give the subject no further consideration.[1]

[1] In this and several succeeding chapters we pass over ground which has been pretty thoroughly worked by psychologists. Especially is this true of the subject of perception. It is difficult to add to what has been said by the two Mills, Bain, Spencer, and Taine. I do not assume, therefore, to give anything more than an outline treatment of the topic of perceptive redintegration, referring the reader especially to the authors I have just named for more complete and detailed expositions. A similar brevity will be adopted with respect to memory, generalisation, reasoning and imagination; an exhaustive consideration of those subjects would properly enough fill a space greater than that allowed for this whole work.

CHAPTER XL.

REMINISCENT REDINTEGRATION—MEMORY.

§ 1. THE chapters immediately preceding have made it clear that no perception takes place which does not involve memory or reminiscence; and, at a much earlier stage, we discovered that no cognition at all occurs within our experience which does not postulate representation. Hence the re-cognition of past experiences pervades all redintegration.

§ 2. Memory involves processes and conditions of perpetuating or storing up experiences which may be made the subject of reminiscence and the processes and conditions of recalling those experiences. The latter we have recently considered in our examination of the factors and our exposition of the laws of the development of states of consciousness. The former passed under our review in our study of the genesis of such states. As supplementary to what has been set forth in these places, there are some remarks which properly may be made.

§ 3. The registering of experiences, it appears, is accomplished by a modification of the nervous structure, making the part affected more susceptible to a recurrence of the same movements which took place in the original stimulation. The greater the amount of force brought to bear in affecting the nerves, the more complete and permanent will be the modification, and hence the more indelible will be the registry. The greater the quantity of sensation, extensive, intensive, or protensive, the stronger will be the impression. If the experience is pleasurable, the mind dwells upon it, thus continuing the experience. Repetition works the same result. Hence we found it true (Chap. XXXV.) that the experiences most permanently impressed upon consciousness are those upon which the greater amount of attention has been fixed. This is in accord with the other laws of redintegration, for it is quantity of sensation and pleasurable interest in representations which detain the attention, and enable the acting forces to impress the experience. It follows that those states most indelibly stamped upon the mind are more apt to be recalled; in fact, indelible impression means nothing more than frequency, and comparative vividness or definiteness of representation, together with voluntary control; in short, revivability.

faintness. In truth, then, this representation
citation of the same nervous tracts excited in
ence. That such a re-excitation does not equal
sity the original excitation is patent, since this
tensity makes the difference between presentati
tive cognition. There is also the further differen
that apparently there is no need of the re-excit
the periphery in order to reproduce the state of
a person becomes blind he may still recall visu
experienced before. But if the entire set of vis
the line of connection between the retina and
were extirpated or disabled, it may well be dou
recall images of sight. Possibly an excitation
to which afferent visual nerves run, would be suff
as yet tell.

§ 5. There seems to be a circulatory system of
A sensation is aroused by impact at the periphery
nervous motion to centres and resistance at those
motion is augmented, diminished, concentrate
From sensory centres it passes to motor centres,
after concentration in higher sensory or ideational
motor centres it is radiated or directed accordin
efferent activity toward the periphery, there to c
ments which are again returned to the centre
nerves are veins, the motor are arteries of the
the brain is the heart where the inflowing curre
are received, and whence they are distributed
the organism according to the laws of habit

sensational experience. The thought of a delicious morsel excites the saliva, the thought of a precipice a shrinking, a bright light a closing of the eyes perhaps or a movement toward or from, the approach of an enemy a frown or a clenching of the hands. The facts in connection with the expression of emotions show that both the outer and the inner periphery are affected very perceptibly by the presence of representative cognitions, and these affections generating pleasure or pain accomplish new excitations, thus giving rise to new ideas and so on round the circle for ever while consciousness lasts. The more strongly a representative cognition is dwelt upon, the more complete the concentration of attention, the wider the circuit, the more extended the radiation, and thus the more nearly does the experience approach to full sensational realisation, until sometimes it does pass into an actual sensational renewal of the original state. The influence of erotic ideas, before cited, is a striking example of this. From all the facts we are warranted in concluding that reminiscence is the revival of former sensational experiences in greater or lesser degree by means of stimuli supplied directly from the centres by currents along motor nerves, either within the central system or within the peripheral system at varying distances from the centres.

§ 7. That representation which is essential to the continuance of a given state is not reminiscence, though it involves the same power. It is probably accomplished[1] by automatic force supplied directly from the centres affected by the sensational stimulus. It is really a subsidence of the motion which originated the sensation and has passed on. The same thing is seen in after sensations, like some of those of colour which we experience upon closing the eyes, or of taste when the substance causing the taste is removed. Of course if the attention is held upon a presentative object the appropriate motor currents will be in operation, and upon intermissions of the sensational stimulus from without will supply an automatic stimulus through motor nerves, thus maintaining the integrity of the experience by a continuous representation.

§ 8. We are able to distinguish our representative cognitions by their difference in vividness from presentative cognitions, because in the normal state of consciousness there is no time when sensations are absent. If all sensibility to external impres-

[1] I am now speaking of the physical side, it must be borne in mind.

sions were removed and at the same time representative processes were at work, only the presentative side of our cognitions would be before us, and we should esteem all that appeared as sensationally happening to us. The train of events would be sensationally real. In dreams and similar states we cognise the occurrences and pictures as sensational and not ideal, presentative and not representative. In the normal state of consciousness, however, we compare our train of representative experiences with our train of presentative experiences, note the difference between them, note also the underlying resemblances, and believe that the former once occurred to us with the same vividness as the latter. This procedure we express in saying we *remember* a certain experience to have happened to us; and with the images brought up by memory goes belief as to their actual occurrence in sensational experience.

§ 9. That which on the physical side is a re-excitation, on the mental side is an image of memory. In the words of Taine: 'Every sensation, weak or strong, every experience, great or small, tends to revive by means of an internal image which repeats it and is itself capable of repeating, even after long pauses and this indefinitely. But as sensations are numerous and are at every moment replaced by others without truce or termination up to the end of life, there is a conflict of preponderance between these images, and though all tend to revive, those alone do so which have the prerogatives required by the laws of revival; all the others remain incomplete or null, according to the laws of obliteration. By force of this double law groups of efficacious aptitudes are constantly becoming inefficacious, and images are falling from the state of actual to that of possible existence. Thus human memory is like a vast reservoir, into which daily experience is continually pouring different streams of tepid waters; these waters, being lighter than the others, rest on the surface and cover them; then, growing cold, in their turn they descend to the bottom by portions and degrees, and it is the last flow that constitutes the new surface. Sometimes a particular stream, from being swollen or having a higher fall, warms ancient inert layers below, and then they remount to the light; the chance of the flow and the laws of equilibrium have warmed a certain layer so as to place it above the rest. The shape of the reservoir, the accidents of temperature, the various qualities of the water, sometimes even shocks of earthquake, all bear part in this; and many authentic instances show

us deep layers uplifted suddenly and entire to the surface, sometimes superficial layers plunged suddenly and entire below.'[1]

§ 10. Memory is both involuntary and voluntary. One thing suggests another, and our thoughts go on calling up a whole train of past experiences involuntarily. But, beyond this, when any pleasurable interest detains the attention we find ourselves in the position of trying to remember something or of voluntarily modifying the train of reminiscences. Let us see what occurs in such a case. I am writing a letter to a friend telling him what I did yesterday. I went to ride in the country, and saw a house which particularly attracted my attention. My present interest is to convey to my friend an idea of that house, and I proceed to describe it. Probably the word *house* comes to my mind together with a picture more or less definite of the building in question. The idea house brings up a multitude of associated words or images answering to *colour*, *size*, *material*, etc. I detain the attention upon each one of these till the particular items of colour, size, or material come into my mind and are written down. The colour *white* instantaneously arises when colour is suggested. I think of *red*, but with my attention fixed upon this particular house *white* displaces and expels *red*, and I associate *white* with the house in the belief, whose certainty is dependent upon the promptness and irresistible pertinacity with which the idea *white* returns, that the house I saw *was* white. I remember clearly that the house was white. If I called it red, it would cease to be the house I saw yesterday. I go on with my description. Presently windows occur to my thought; the idea *house* is inseparably associated with the idea *windows* in my experience. I remember the house had windows. I fill out the picture with one, then two windows to a story on one side. There is then an indistinctness. My associations of houses are such that a house might have one, two, three, or many windows on one side. My recollection is here at fault; I do not remember whether there were two or three windows on that side; I try to remember how many there were; I do this by detaining the attention upon that side in the expectation that by remembering a contiguous part of the picture, its neighbour will be after a time reproduced. I thus make an effort to remember. The side with two windows and the side with three in alternation appear in the picture. Finally I remember that I changed my point of view, and looked

[1] *On Intelligence*, Bk. II. Chap. II.

back as I was passing; then the whole picture changes, and I remember distinctly the third window seen from the altered position. Another instance is that of names. I remember a person I saw a few days ago. His face is distinctly represented. Everybody whom I have met has had a name, this experience being a uniform one; hence the idea *name* occurs to me as expressing something belonging to this person, yet I cannot remember the name. I try to remember it and make this trial by fixing the attention upon this person and at the same time upon the idea, usually the word *name*. A variety of names suggest themselves, *Smith*, *Jones*, *Brown*, *Robinson*. Perhaps as the name *Brown* comes up, it attaches itself to the idea of this person so strongly and unequivocally that I say to myself, 'Yes, I remember now, it was Brown.' Perhaps none of the names do this, and I patiently or impatiently wait for other names. Finally the right one comes, or I become tired and turn my attention to some other matter, deciding that I cannot remember. These two examples are typical of all the experiences of trying to remember. It is simply interruption of the current of representations by fixing the attention upon some representative object. That which is remembered revives something similar which contains particulars of the image which are not contained in the first image; their presence in the second and perhaps in many other similar images recurring makes us believe that we have forgotten similar particulars which should be in the first. Frequently or usually the second representation is a concept or general name bringing up associations of many experiences. These secondary associations make us aware that the representation of the object primarily before us is imperfect, and also point out wherein the imperfection lies. The voluntary part is detaining the attention; then by-and-by images are supplied involuntarily, which are recognised as belonging to the representative object upon which the attention is kept fixed. Whether or not these images come, or what images appear, depends upon the laws of association and representation. In the revival of experiences under these circumstances unconscious redintegration is very prominently exemplified.

§ 11. We remember the perceptions of past experience in their relations of co-existence, sequence, quality, and quantity. Not only do we remember experiences of the Non-Ego world, but also our memory is very largely of the integrations formed by our own mental activities. Memory is made up not merely of repre-

sentations, but of re-representations of high degrees of complexity. The higher integrations are more apt to be revived because they involve a greater amount of repetition. What forms these integrations take we shall see in greater detail in the succeeding chapters. The objects which memory brings up are chiefly representations of the objects of sight and hearing. We remember the pictures of the world about us which the visual perceptions with their associations fix in experience, and also the auditory experiences connected therewith, far more readily than the perceptions otherwise attained. When we refer to language, the truth of this assertion will be evident. In addition to the pictorial or panoramic representations of the external world, words seen and heard fill the most important place among the images of reminiscent redintegration. With nearly every representation comes a name or set of names, and since all memory involves a cognition of agreement and difference, propositions expressive of the agreements or differences noted are made use of constantly in all reminiscent thought. 'Thinking-aloud,' so frequently observed, is an evidence of this. Though the use of language is more conspicuous in some other modes of redintegration soon to be examined, it is by no means absent in reminiscence.

§ 12. Reminiscence exhibits the differentiating processes of mental activity. Objects succeed each other in trains incessantly moving. Hence the laws of representation rather than those of association express the facts of which science takes account in connection with memory. We review objects and associations of objects, but the process of reviewing is not association; it is representation. That we must revive integers is certain, because our original experiences are all integers.

We perceive wholes, because all our cognition is of agreements in differences, and the process of cognising is integrating the likenesses in experience. In reminiscence, therefore, we must at least recall things having a consistency sufficient to make them appreciable integers. As to the connection of objects in representation, since the process is one of reproducing past experiences, it follows that if an object be represented its connections in co-existence and sequence will be represented also, or at least some of them; and all are liable to be reproduced. The course of simple representation, however, is modified by the circumstance that new sensations are continually being excited by the environment. The attention is fixed upon these, and the train of recollec-

tion is broken up. It is also broken up by the detention of the mind upon a pleasurable representative object. Now since like experiences occupy like tracts in the nervous system and are there registered in the manner we have before considered, that excitation which is the physical side of an experience will propagate itself and arouse like experiences which have been stamped upon contiguous tracts, but which in the original sensational experience were not in contiguity either of time or place. Hence in representation there is a tendency not alone to represent contiguities but also experiences like the one upon which the attention is fixed. (See also Chap. XXXII. § 19 ff.)

§ 13. The contiguities we remember are either resemblances or dissimilarities, likenesses or differences, really integrations redintegrated with the primary experience by some degree or condition of likeness. All integrations have a relativity to some other integrations, and to this extent are redintegrated with them. All cognition and recognition involve a cognition of agreement and difference, consistency and relativity in their objects.

§ 14. The voluntary discipline of memory is accomplished chiefly by repetition. 'Committing to memory,' 'cramming,' are processes of fixing in the memory by artificial repetition. That this is tolerably effectual we all know, but it is greatly improved in effectiveness if a pleasurable interest can be induced. Under the latter circumstances the lesson is learned with far greater rapidity and far greater certainty of retention.

§ 15. Pleasurable interest is so controlling in matters of reminiscence that painful experiences of our past life are largely excluded. We can remember the fact of a sickness, but the painful feelings of that illness we cannot reproduce save very faintly, and the mind does not even love to dwell upon the fact. It speedily gives way to some more pleasant recollection. Visual and auditory symbols of painful experiences which are associated with the latter will come into the train of reminiscence. If, however, there is any revival of the feeling of pain these symbols fly out of consciousness; but very frequently, so far are they from reproducing the former pain that they actually produce pleasurable feeling through other associations. I remember that my eyes were very sore from snow-blindness the night after I descended from Monte Rosa, but my recollection of this circumstance only excites feelings of pleasurable pride and vanity over the achievement.

§ 16. Habitual conjunctions in past experience, whether brought about by the uniformity of nature in the external world, or through voluntary direction toward the things upon which the mind loves to dwell by preference either ancestrally or experientially organised, possess the field of memory and make up the greater part of our reminiscent redintegration. They constitute our mental acquisitions which we can depend upon to reproduce at will.

§ 17. There are many interesting facts to be noticed with respect to suspension and failure of the reminiscent powers and with regard to abnormal developments of memory. Some of these we shall have occasion to remark in subsequent chapters.

CHAPTER XLI.

CONCEPTIVE REDINTEGRATION—CONCEPTION ABSTRACTION, ETC.

§ 1. WE now pass to the examination of that phase of redintegration which produces representative cognitions of the fourth and fifth degrees (Chap. XXXVII. § 12). Here we come upon a higher and more complete synthesis of the external and the internal, a process of more elaborate integration, of condensation and concentration of knowledge, making one symbol stand for many experiences, and thus greatly extending the reach of cognition.

§ 2. The law of association (Chap. XXXV. § 15) expresses the facts of the process of integration which goes on continuously in consciousness. Similarities are united, forming wholes when the parts are contiguous and homogeneous, and forming aggregations or clusters of integers when they are not contiguous or are less homogeneous. Where objects are not united as parts of a whole their aggregation implies features of community through which the association is made.

§ 3. Where two objects are cognised as agreeing, the agreement may be complete, in which case the two are immediately merged into one object and constitute one integer. This is perception. The union of two or more objects in co-existence or

sequence is also perception, the agreement not being so complete as to allow of complete merger. But there is a further operation involved. When two objects are perceived, as two bricks lying near each other, we have observed that certain attributes are perceived. We perceive what we call magnitude or bulk, figure, and position. We mean by this that these objects agree with each other in certain relations to the perceiving subject which certain other objects we have perceived have had also. In other words, we classify these objects with certain other objects by certain resemblances. Similarly with statico-dynamical attributes, as hardness, friability, etc.; similarly with dynamical attributes, as colour. The sight of these two objects evokes a vast number of other objects resembling the first in one way or another. We early learn to put names as marks upon objects perceived; we are told that these objects before us are bricks; we apply the name brick to each of these objects, and if there is occasion to indicate that there is a plurality, we number them as No. 1 and No. 2. Undoubtedly when we first see a brick and are taught to apply to it the name *brick* which we have never heard before, *brick* is to our mind a proper name, that is, the name of an individual. When a second brick is seen we class it with the first; so also when a third and a fourth are met with; so also when we remember a brick. We thus form classes of objects which are associated together, and apply to these classes a general name covering the whole class and its individuals. All perception involves this process of classification. Every object perceived is classed with some other associated objects; everything is related to some other thing.

§ 4. Integration, therefore, forms classes of objects, which are marked by general names, as *brick*, *house*, *tree*, *dog*, *man*. But this is not all. The individuals of a class differ from each other, else they would not be separable individuals. They are associated, however, not by their differences, but by their likenesses. The agreeing attributes are associated, and the rest left out. The two bricks before us may differ greatly in size, but they both happen to be red, we will suppose. The redness of the one is associated with the redness of the other; various other objects are recalled, differing very widely from bricks in other respects, but still agreeing in colour. When the attention is fixed upon this redness, a multitude of red things is represented—red wood, red stone, red cloth, red paper, red earth, blood, red flowers, and many more, with varieties of shading of all sorts. In all these the colour is

the prominent object of attention, the remainder of the representation being faint and readily dismissed from consciousness. We form a class of objects with respect to which all but the common attribute is obscured or left out, and thus make a new integration which we designate as *redness*. We then say the two bricks in question agree in redness.

§ 5. Association thus forms classes of attributes as well as of substantial objects, which attributes are marked by abstract names. The general notion formed of substantial objects is termed a *Concept*; that formed of attributes is termed an *Abstract*. Concepts and abstracts exist in great variety, both as to their connections in association and as respects degree of integration. In the next Part we shall treat of these notions in detail, considering them as products of integrating activities. Much that would be pertinent here will be deferred and said there; we are now concerned only with the processes involved as exhibiting operations of redintegration.

§ 6. Over general names and terms was raised one of the most celebrated controversies known to the history of philosophy, I mean the prolonged war between the Realists, the Nominalists, and the Conceptualists. Into the history of these disputes I do not propose to go; nor do I deem it worth while to enter into a criticism of the leading positions taken on either side. The polemics of the subject have been quite exhausted. But it is incumbent on us to explain what the process of formation of these notions is, and what the objects of consciousness are when they are created.

§ 7. The leading process is obviously association, the assimilation of contiguities, so as to form integers of these associations. That this association cannot take place without attention and representation need not be repeated. But the activity in exercise is an integrating activity, and the two chief lines of its development are those just indicated under the names *Conception* and *Abstraction*.

§ 8. The objects of consciousness are nothing but representative cognitions, which consist of a definite representative object as a symbol, around which are clustered many relatively indefinite associations. This symbol is usually a name, which is itself classed with others as a general name, applicable to many individual objects. The name ordinarily recalls one or more individuals of

the class, and to this is added the inference that there are, or may be, many such.

§ 9. Two illustrations given by Professor Bain will sufficiently exemplify, with what has been already given, both the nature of the generalising operations and their immense importance in redintegration. 'We identify the different running streams that have come under our observation, in consequence of the sameness that appears prominent in the midst of much diversity; any new one will recall the previous ones; and they are assembled together in the mind, not as a miscellaneous aggregate, but as a class strung on a common thread. In this connection, they add to our information of each; some we know chiefly at the sources, others at the mouth, some in the mountains, others in the plains; accordingly we supply gaps in our knowledge of any one by means of the rest. We may go the length of deriving out of the fragmentary views an unbroken whole, an ideal river, that shall include all the features of a complete river; or we may simply choose one that we know better than the rest, as our representative instance, and from it supply blanks in our view of such as we have less perfectly examined. This mutual supply of defects in our knowledge of individuals is one of the advantages of assembling objects in a class; a second advantage is the substitution of one for another in any practical end; we know, for example, by some single experience, that a river bank is a convenient site for a town or village, and so we can choose any one of all the rivers in our knowledge for the same object. Here then we have first a *classification*, assembled by the attraction of similarity; secondly a *generalisation*, or general notion, concept, or abstract idea, being some typical river that fairly represents the group, and in which we include only what they all have in common; this typical river may be one of the number, or it may be a composition out of several. Thirdly, we have the application of a *general name* to the class, the name "river," which shall express both the whole and what each has in common with every other. A fourth operation is all that is necessary to complete the work, namely, to furnish a *definition*, or an expression in language of the agreeing features or common properties of the class. This exhausts the series of operations connected with the generalisation of objects taken as a whole or a unity. . . . .

'Take next the genus of round bodies. As before, these are first mustered by the attraction of sameness; their identification

has the effects already specified of mutual enlightenment and mutual exchangeability. Following up this operation we seize upon some one instance as a representative or typical instance, and our idea of this we call the abstract or general idea. We can here adopt a very refined method; we draw an outline circle, omitting the solid substance and presenting only naked form to the eye; this is an abstraction of a higher order than we could gain by choosing a specimen circular object, as a wheel, for it leaves out a greater number of the features wherein circular bodies differ. The mathematical diagram is thus more of an actual abstraction than the idea of a river or of a mountain derived from a fair average specimen, or than a composite river or mountain. We may advance, however, from the diagram to a definition by descriptive words; and we may adopt this as our general conception and use it in all our operations instead of, or along with, the other. A circle is defined to be a line at an equal distance from a point which is the centre. The definition is, in fact, the highest form of the abstract idea, the form that we constantly fall back upon as the test or standard for trying any new claim of admission into the *class*, or for revising the list begun with.'[1]

§ 10. Conceptive redintegration, therefore, involves perception and reminiscence. It includes classification, generalisation, conception, abstraction, and definition—different names for the same processes or parts of the same processes. In addition it includes, in common with all other cognitive states, the consciousness of agreement and difference between a plurality of things. Hence judgment, or the cognition that objects agree or differ, is a part of conceptive redintegration; and this, of course, postulates comparison. Nor must we lose sight of the fact that belief and inference are essential to this as to all varieties of cognition. Once more we are impressed with the necessary interdependence of all the cognitive activities and capacities.

§ 11. Conceptive redintegration is the foundation of all science and philosophy. We seek to condense what we know into general truth. In our perceptions, recollections, reasonings, the mind is incessantly aiming at greater generality. The intellect eliminates particulars or fuses them into generalities. All science is an integration of knowledge; philosophy is the most completely unified knowledge (Chaps. I. and II.). We value our knowledge most highly as it is thoroughly systematised. If we take any

[1] *Senses and Intellect*, Chap. II. Sec. 34.

science whatever, we shall have an example of the method of all. In Entomology, for instance, the naturalist sees insects of a similar structure, having the wings encased in a horny sheath; others having their wings extended and covered with scales; and again others with membranous wings. He associates the general features of each set, and classifies the objects possessing these common features, as Coleoptera, Lepidoptera, and Hymenoptera, marking each group by a common name. Henceforth the particular characters of individuals lose their interest, and do not maintain the same hold upon the memory that the general features preserve. As observation widens, more general characteristics are noted; insects are distinguished from myriapods and crustaceans, and so on upward until the whole animal kingdom is mapped out and reduced to scientific order. As this is done the hold upon individual items of knowledge is weakened. The unimportant matters become undistinguishable, and fade from the memory entirely. So prone are minds to generalise, and retain, and apply to new cases their generalisation, that the tendency needs to be carefully guarded and oftentimes repressed, since imperfect and incorrect generalisations will be made and become so firmly established that no amount of subsequent training can eradicate them.

CHAPTER XLII.

DISCURSIVE REDINTEGRATION—REASONING.

§ 1. REASONING is Mediate Inference. Mediate Inference is a series of Immediate Inferences. And Immediate Inferences are representative cognitions which may be viewed also as beliefs, belief and inference being both phases of representative cognition. The simplest and most direct inference lies in the cognition of identity or similarity between two objects, the essence of the agreement being the cognition of interchangeability between the two, so that one may be substituted for the other. In believing, the mind dwells upon two cognitions seen to agree or differ, without considering attentively the relations of those two cognitions to anything save each other. In inferring the mind usually connects two pairs of cognitions, and cognises a relation of agree-

ment in difference between them. Inference is a necessary part of all cognition (Chap. XXXVIII.).

§ 2. From the explanation of the nature of mediate inference given in the former chapter, it will be apparent that the operations we call reasoning present no new features, but only afford further illustration of the laws of redintegration which we have already found so pervasive. Attention being presupposed, association of contiguities and representation of like objects make up the whole process. The products appear in great variety, and will be examined in some detail in the next Part. It would seem, therefore, that we might conclude the chapter at this point; but there are a few considerations to be adduced to make more clear the nature and method of this variety of redintegration.

§ 3. Reasoning, then, is association of one object with another through the mediation of a third object, a fourth, a fifth, or more, as the case may be. What, then, is the difference between reasoning and reminiscence and between reasoning and perception? Reminiscence is re-perception, so that we have only to consider the difference between reasoning and perception. That difference is a difference of directness. In perception A is cognised to be like B; in reasoning A is like B, B is like C, A is like C. A is carried over to B, identified with it, so that thenceforth A and B are associated as one cognition, or at least as having some common attributes. B then brings up its like C, and then C becomes associated equally with A. The law of association (Chap. XXXV. § 15) indicates the existence of a difference in the completeness of the integration arising from remoteness of the object brought up for association with another. The course of association, leaping over one object to another, reaching out beyond its proximate objects and thus making an indirect connection, is exemplified in reasoning. Two objects in close contiguity are united in their homogeneous qualities by the process of perceptive association; an object farther away is united with another object, through the mediation of a third by discursive association.

§ 4. Reasoning, like perception and reminiscence, involves classification. Indeed, the process, as generally understood, is applied chiefly to the inclusion of an object within a class, and thus associating it with all other individuals of that class by some common relation. Thus conceptive redintegration plays a very important part in reasoning. Classification postulates inference, and inference implies classification. When we associate two things by a

common attribute, we initiate two classes, one of objects and the other of the attributes; having done this we bring up in representation a third thing similar to the second, and join this with the other two, embracing it both in the class of objects and in the class of attributes. This process with its expressions constitutes reasoning. As Mr. Spencer expresses it: Reasoning is 'the indirect establishment of a definite relation between two things by the process of establishing a definite relation between two definite relations.'[1] The same author thus shows the connection of reasoning and classification: 'A consciousness of similarity, underlying at once the act of classification or general inference and the act of ratiocination which gives any special inference, is the basis of either or both. Along with the visible attributes of an orange, there are mentally represented in various degrees of distinctness some, many, or all of the attributes before found in relation with such visible attributes; and according to the mode in which they are represented, the thing predicated is the class or some one or more of the attributes. Let the unperceived attributes be thought of in their totality, without any of them becoming specially prominent to consciousness; then the object, in being mentally endowed with all the characteristics of its class, is conceived as one of that class, or is classified. Let a single unperceived attribute, or a single group of such attributes, arrest consciousness and occupy it to the partial exclusion of the other unperceived attributes; then we have a special inference, or what is verbally embodied as such. Of course the two processes being thus related run into each other so readily and rapidly that probably neither ever occurs without the other. It is scarcely possible that the aggregate of unperceived attributes should be thought of without some of them being represented more vividly than the rest; and it is scarcely possible that any of them should so engross the mind as to banish all others entirely. Always the attribute inferred has for its indistinct background those many accompanying attributes which constitute the conception of the object as one of a class; and always among the many attributes united in this classing conception, some stand out as incipient inferences. A latent classing accompanies the inferential act; latent inferences accompany the act of classing; and each continually arousing the other alternates with it in consciousness.'[2]

[1] *Prin. of Psychology*, Part VI. Chap. VIII.
[2] *Op. cit.* Part VI. Chap. IX.

§ 5. From what has been said it appears that discursive redintegration accomplishes the detection and integration of uniformities in nature. These uniformities in a previous chapter (Chap. XVII. § 26) we reduced to (1) Uniformities of Quantity; (2) Uniformities of Quality; (3) Uniformities of Co-existence; (4) Uniformities of Succession. Reasoning, therefore, develops cognitions of these relations. Quantitative reasoning takes cognisance of equality and inequality of things and their relations with respect to magnitude, and leads to conclusions in which the quantity of certain existences of determinate quality is predicated. Qualitative reasoning brings forth conclusions in which the thing predicated is either the quality of certain determinate existences or the existence of certain determinate qualities. Conclusions respecting co-existence relate to statical conditions and relations; those respecting succession to dynamical relations.

§ 6. The products of discursive redintegration are arguments; and in the chapter relating to arguments (Chap. LIV. *post*) I shall continue and conclude what I have to remark upon this branch of intellectual activity.[1]

CHAPTER XLIII.

CONSTRUCTIVE REDINTEGRATION—IMAGINATION.

§ 1. VERY closely allied with reminiscent redintegration is constructive. In our classification of representative cognitions (Chap. XXXVII.) we first introduced the latter next to the former (§ 12). But I have not preserved this order in treating of the different phases of redintegration, because it seemed desirable to take some account of general notions before dealing with imagination, inasmuch as the most complex products of constructive redintegration largely embrace these notions.

§ 2. The processes of constructive redintegration develop representative cognitions of the third and sixth degrees. These, con-

[1] Mr. Spencer has given so complete and thorough an exposition of Discursive Redintegration as a psychological process (*Principles of Psychology*, Part VI.) that it would be an imposition upon the reader for me to do more than say what I have said in the text, and refer him to the chapters of Mr. Spencer's work for the most adequate treatment of the subject in psychological literature.

sidered as products of the plastic powers of the mind, may appropriately be termed Fictions.

§ 3. The forces of nature in the external world operate to produce effects which would not have been anticipated or at all foreseen if we had given only the forces themselves. The planets and suns are made to grow, to assume their places and to retain them, moving in their orbits with regularity and in order, by the action of forces of attraction and repulsion. All their phenomena are manifestations of force. No one having the experience of force in holding a weight in the hand or in seeing a rock fall would be able to say, before he had studied the operation of the laws of nature with care and thoroughness, that the same forces shown in the experience just named could work out the planetary system. And even after he had discovered that by the same forces the starry hosts are marshalled, he would not expect that by those forces the lightning could be evoked or the magnetic needles directed. And again, even when these latter effects have been learned as resulting from the action of attractive and repulsive forces, who would be able to predict the beauties and wonders of crystallography as manifestations of the same? Forms of force manifestation altogether new and different from others constantly occur, but when analysed reveal only new combinations of old effects or new operations of well-known powers, which from the beginning have in them the potency of the results brought out at various stages. In the operation of mental powers a similar class of facts is found. It is difficult at first thought to understand how the creations of scientific and æsthetic genius can be accounted for by the laws of redintegration, and yet such creations can be comprehended better *à priori*, and predicted with more certainty, than new effects from the operation of laws in the physical world. Inasmuch as association is of different degrees of strength, and inasmuch as the bonds and links of association are so multifold, it can readily be understood how new products must result, different from previous experiences. If association involved only the passive reception of impressions, mental creations would not be explained by its laws. But regarding it as an activity of the mind integrating experiences of conscious life, obviously there must soon be products which are not as integers, copies, or simple representations of exactly corresponding integers of past experience. And given the constructions of imagination, their formation can easily be traced to the operation of the laws of redintegration.

§ 4. The manner in which new constructions are wrought out by mental power may be seen upon a little consideration. It may be illustrated by the analogy of the formation of a crystal, like one of alum. A nucleus is deposited in a dish of the solution and attachments begin to take place on all sides, but in definite lines. Adherence in one direction is diminished and in other directions it is increased. Growth takes place, until the crystal assumes a regular form, emerging from the surrounding solution. It is all the while environed by points at which adherence might take place, and the growth might be in one direction or another apparently; yet the balance of forces is such that it does take place only in certain defined places and directions. A new thing hence appears, but the product of forces which are not new. Now in mental experiences there are innumerable lines of association, points of contact without limit, and as the associations gather about a given nucleus, they attach themselves to this and to each other. The reproductions are not perhaps reproductions of entire links, but of broken links; these coalesce with other chains, and these again with others, forming new groups and aggregates continually. Thus products arise which are not as wholes copies of previous experience, though there is nothing in them which experience has not given and which has not been presented through the senses, except the power which unites and holds them. Consequently, that redintegration which we call constructive differs from other redintegration only in the products.

§ 5. For further and more detailed illustration of the process of constructive redintegration, let us follow Professor Bain, condensing his exposition of the subject for the purpose of obtaining examples of the manner of operation of this activity.[1] And first let us observe that intellectual constructiveness is manifested in combined and co-ordinated movements. Learning the movements of a military drill, a gymnastic exercise, or a dance, exemplifies this fact. When by repetition the mind has become perfectly familiar with the separate movements, one recalls the others, and in different combinations according to circumstances. There is no difficulty in joining the movements in different collocations, thus giving rise to various figures. There enter into these efforts of volition of course, but so far as the intellectual movements are concerned, there are no other activities present but those of redintegration. The readiness to form combinations is

[1] *Senses and Intellect*, Chap. IV.

increased as familiarity with the separate experiences is increased. When a person learns to swim, he brings into play movements with which he is already in a degree familiar. The voluntary control of the arms and legs he has already; he then practises the movements needed in swimming separately; his next effort is to bring them together in the proper combination. He does not succeed in the first attempt, but after a while he hits upon the rhythm, and when once it is perceived it is persisted in. By a few repetitions the associations are made firm. In all efforts like these there must be previous command of the elements entering into the combination, which is a matter of previous acquisition; a sense or conception of the effect to be produced; and voluntary successive trials until the effect is actually produced. Here then we have volition working in and upon the materials which association brings up. Association directs the volition, and volition again stimulates and produces the association: thus in learning movements unfamiliar, through the combination of movements which are more or less familiar, constructive redintegration operates to furnish an intellectual guide or standard for the volitional activities.

§ 6. A similar line of remark can be made regarding the acquisition of language. The child joins syllables into words, frequently without having ever heard the words he pronounces. Familiarity with the syllables *ba* and *na* causes an association to spring up by which the child passes to *ban*. By association, the phrase '*give me*' is acquired; also the word '*mamma*;' and desiring to give something to mamma, the association between *give* and *me* is displaced and that between *give* and *mamma* created. This implies, most certainly, an effort of volition as at its root and foundation. Two phrases are present to the mind, a prompting of volition exists, to satisfy which the associating acclivities are stimulated until an association is reached which accomplishes the purpose. An association follows a certain train, then breaks off and joins another, making a combination different from either train. Here, as before, constructiveness is dependent upon strength of association, which is brought about and fostered by feeling and consequent volition. As the requirements in the use of language are greater and higher, the range of constructiveness is wider. Forms of grammar, of rhetoric, of poetry, and of melody must often be observed, and thus the associations must be more numerous, and the difficulty of attaining the right one to satisfy

the requirements of volition will be heightened, but the possibility of making a greater number and variety of constructions will equally be increased. There will exist many ways of bringing out the same effect, and many combinations which will produce effects more or less closely approximating to the desired result.

§ 7. When, having had the experience of a mile, we endeavour to form an idea of two miles, we perform an act of intellectual constructiveness having reference to our muscular system. We have the idea of a mile, and we have the idea of doubleness, both derived from our experiences. By uniting the two, we construct an idea of two miles; this union is an effort of association stimulated by volition. Many such associations are made with reference, not merely to distance, but also weight, form, size, and so forth. By fixing the attention upon the form of a circle and the area of a square pane of glass, we can construct the cognition of a circular piece whose diameter is the side of the square. Architectural proportion in buildings is determined by constructive association. By moving and lifting pieces of stone of small size, we acquire a certain estimate of the weight of the material; an estimate which is readily extended constructively to large blocks which cannot be directly manipulated. By multiplying known feelings of muscular expenditure, we imagine, perhaps inadequately, the weight of a solid stone lintel, and by similarly multiplying our experiences on a small scale, of the tenacity of stone, wood, or iron to resist pressure, we pronounce upon the sufficiency of two props of stone, or wood, or iron, to sustain that lintel. From such a course of redintegration we derive our feelings and perceptions of architectural fitness, or of the beautiful in support.

§ 8. There are many constructions or imaginings of organic feelings, and special sensations and combinations of them, existing more definitely, as the representation of the sensations is more easily accomplished. If we could readily represent the pains and pleasures of organic life, we could easily form new combinations of them. Inasmuch, however, as in most of the sensations of organic life there is a low degree of revivability, we do not find it easy to make new constructions. The same thing is true of taste and smell. In the tactile sensibilities combinations are more readily effected by constructive redintegration, and for the reasons just stated within the realms of hearing and sight constructions are of great variety and extend over wide reaches. In music we may hear an air sounded by the voice or on

an instrument, and wish to imagine it on a different instrument or by a different voice. If we have a clear representation of the air and the tones of the second voice or instrument, this can be effected through association. An imitator or mimic often succeeds in modifying his recollections of the original to suit an entirely new discourse. Passing to visual representations—I see or remember a line of houses; I can imagine it prolonged to double or triple the length, or I can transform the whole line by adding a story to the height. In the landscape I see a wood and a mountain separate and apart; I can place the wood upon the mountain, and this the more readily as I have seen forests upon mountains. Or, again, having the representation of a mountain, something suggests *gold*, and I can clothe the mountain with the imagination of quantities of gold within and upon it. So also, if I see a dress, I can readily imagine it to be of another colour, but I am apt to substitute the colour I have a liking for or the one with which I am most familiar.

§ 9. An interesting illustration of constructive association is found in the process of concreting the abstract. If we have the geometrical form of a pyramid and the colours and weight of granite, we can conceive of a granite pyramid as existing in nature. When the plan and sections of a building are given we can realise the form of the solid building. The colour of the surface or the appearance of the material to the eye added, makes the concrete complete. The plan and sections would not be sufficient to give full solidity unless solid shapes had previously been seen. The mind fastens upon some remembered building or form of building, and alters and adapts it till there is brought out a correspondence with the plan. In order to realise in imagination a Gothic church from a builder's design, the view may be directed upon some church already familiar, and on that the requisite alterations may be made. The great necessity in these cases is to have a previously-acquired store of well-fixed objects of the particular kind. When the past experience of the individual has filled the mind with such objects, and if naturally the mind is inclined to picturing and concreting, the process of construction is a simpler one. Imagining a country from a map is another illustration of the same operation. Realising a natural history object as a mineral, a plant, an animal from a description is yet another. When from description and definition we can produce a scene in nature, or realise the parts of the human body, or the constitution of the

universe, we accomplish the most difficult undertaking of constructive mental effort. However, it is by analytical process, resolving aggregates into their ultimate constituents, that we obtain the means of making new constructions differing from and superior to experience. New creations of science and new constructions of practical industry result from the power of rearranging and re-constituting the ultimate elements of existing things. By association we pull things to pieces, and by association they are again re-united in new wholes. The two processes of disintegration and renewed integration are all the time going on and working out those products which we term the creations of genius.

§ 10. Sometimes we have occasion to make use of imagination in representing things of great subtlety. The abstract idea of a gas is an instance. Here the material is not apprehended by the senses, and cannot be represented by an example or an outline. Much more difficulty is there in arriving at an idea of the property common to all gases as a class. The method of procedure is this: ascertaining by experiment the properties of one gas, we mark those properties by comparison with the properties of solids and liquids. Air, for example, is found to be inert and to have weight and elasticity. The latter we discover to be in a large number of instances the prominent element of a gas, and we thus associate in a class those uniform bodies possessing elasticity and make that a distinguishing mark of the class. In similar ways the world has attained to abstract conceptions of the properties expressed by heat, electricity, chemical affinity, and so forth. The definitions of these properties are constructions elaborately wrought out. The means of effecting them are, however, the ordinary forces of association, which bring up to view various facts, expressions, and comparisons in order to make tentative combinations; and these are gradually improved upon as their unsuitability to the particular phenomena is discovered on examination. An intellect accustomed to the kind of conceptions necessary and acting vigorously in the revival of them is naturally qualified for the work. A second requisite to facile constructiveness is a clear perception of the subject to be seized or of the particulars to be suited. This depends upon strength of association by which particulars are impressed upon the memory. Following these two requisites, the material of construction and a clear sense of the fitness or unfitness of each new tentative, is a third, namely the power of patient

trial, though error result time after time. The number of trials requisite to arrive at any near construction is ordinarily very great. The power of patient thought may depend upon a strong inherited predisposition toward the subject under consideration, or on an acquired passion for it by which the ideas necessary are readily associated and detained for the purpose contemplated.

§ 11. The operations of discursive redintegration likewise involve constructiveness. All the devices of mathematics by which truths are arrived at through short methods and expressed artificially are the products of constructive redintegration. The entire structure of the mathematical sciences has been reared through constructive associations. While reasoning is possible without any distinctively constructive operation accompanying it, the redintegrating activities usually accomplish more or less construction. After associations have become at all complex, construction in one direction or another is all the time occurring. The greater the quantity of material of association and the more thoroughly it is broken up, the greater the certainty of new constructions.

§ 12. It is in the realm of fine art that intellectual constructiveness finds its most conspicuous exemplification, though in all the practical arts, as exhibited in the genius of the inventor and in practical adaptation of means to end, we might find abundant illustration, if space admitted. The difference between scientific constructions and æsthetic is merely a difference in the subjects associated. The scientific mind forms its trains with reference to truths to be attained, facts to be classified and arranged; the æsthetic mind is determined with reference to things pleasurable and painful in the great variety of emotions which spring up from the basis of pleasure and pain. The emotion of terror may be taken as an example of an inspirer of intellectual constructions. A man once terrified sees only objects of dread. Ghosts and hobgoblins fill the imagination of the superstitious person, while more substantial forms of evil haunt a mind not prone to superstition. Creations of terror of one sort and another are formed, and pervade the mind. A routed army doubles, trebles, or quadruples the number of its foes. In times of great panic from any cause the minds of masses of people are filled with fictions of the imagination. Terror is associated with the things that have occasioned terror. When, therefore, the feeling is aroused, these associations rise

with it and form compounds of images, the associations taking new directions and forming new products.

§ 13. A similar line of observation may be taken with respect to feelings purely egoistic. Self-complacency suggests merits and virtues, and constructs an exalted estimate of self. Vanity creates pictures of admirers and worshippers. The dreams of ambition in a sanguine temperament will create a history of the future embracing a whole fabric of wonders and triumphs which are constructed not only without labour, but which no labour can arrest. In these cases we have exhibited a great contrast to the labour and difficulty with which most constructions of science are made. A powerful emotion, like that of ambition for instance, is daily and hourly at work associating itself with objects and incidents adapted to its gratification; the current of the person's thought is so constantly turned in these directions that after lapse of time, the growth of these associated ideas has become so great that it predominates in the mind and its constituents manifest themselves upon the slightest excitation.

§ 14. The emotions of harmony, beauty, sublimity, picturesqueness, pathos, humour, and the like are of the class which properly may be termed fine art emotions. They in like manner are identified in experience with the objects which originally produced them. These emotions and objects are reproduced with their aggregated associations, and out of these materials the artist makes his constructions. The end which he has in view is determined intellectually by his associations; this end governs volition and succeeding associations. The artist chooses and rejects till his end is satisfied. He has many conditions to limit him—the melody, harmony, pathos, humour of the construction; the effect it will have upon the minds of others; discordant effects are to be excluded; the useful is to be saved as in decoration, while the beautiful is to be sought. All these restrictions make the labour of the artist more difficult than that of the dreamer, and even may cause it to become as wearisome as the hardest efforts of scientific construction. The greater the amount of associated material, the more able is the artist to evolve the sought for creations.

CHAPTER XLIV.

REDINTEGRATION IN GENERAL.

§ 1. WE have now adverted to five leading varieties of redintegration—Perceptive, Reminiscent, Conceptive, Discursive, and Constructive. These five exhibit the most important phases of intellectual development, regarding the processes, or the course of development, rather than the products, though, as we have seen, their differences are determined by the products, since precisely the same processes have been seen in all the varieties of redintegration.

§ 2. The same complementary character of mental operations, which we have so uniformly observed in all our study thus far, is no less conspicuous with respect to the different modes of redintegration. There is not a single experience which we are able to refer to one of the above modes of activity because of its prominence in the experience, which we do not find to involve the others. Though perception of some sort would doubtless be possible without conception, we have seen how even our simple perceptions, ordinarily so regarded, involve classification and generalisation; also we learned very early that they postulate memory; likewise inference; and more lately we have seen constructiveness at work with perceived objects to fill out wholes of which some part only is presented. The same interdependence has been noticed when we start from any one of the other modes of redintegration. Each seems necessary to and a part of the others, though in a given experience redintegration will follow one or other of these modes so predominantly as to characterise the experience with reference to its intellectual processes, thus enabling us to classify the course of mental operations as being predominantly perceptive, conceptive, discursive, reminiscent or constructive.

§ 3. The exposition has furnished us with ample illustration and abundant confirmation of the laws of redintegration hitherto laid down (Chap. XXXV.). Attention, association, and representation working together, and working according to the laws just referred to, have been found necessary, and all that is necessary, to

develop all the modes of action which we have had exhibited to us, so far as intellectual movements and influences are concerned. By this agreement between fact and law the truth of the whole doctrine of redintegration is confirmed, and we are assured that mental life is developed after its genesis according to the law of evolution, from the simple, the homogeneous, and the indefinite to the complex, the heterogeneous and the definite, through a continuous process of differentiation and integration.

§ 4. This tendency to renewed integration is discernible in all mental life. The incessant movement toward greater generality we remarked in connection with conceptive redintegration (Chap. XLI. § 11). In all experience the automatic activity is in operation to consolidate and integrate, the weaker associations being lost while the stronger are held together, reunited and perpetuated. The integration of language is an index of the integration of thought. Letters are integrated into words, words into propositions, propositions into discourse, marking a corresponding integration of cognition. There exists a manifest disposition to condense, consolidate, abbreviate, symbolise, abstract, generalise, prevailing both involuntarily and often unconsciously, and also in obedience to selective action. This we have previously asserted, and we are now entitled to re-affirm it with a greater positiveness as a valid induction from observed facts.

§ 5. A manifest result of this process of renewed integration is to form associations in certain directions, and hence to exclude and prevent other associations. This expresses the law of habit on its intellectual side. Exclusion is exhibited in two ways, one when states are developed which are absolutely exclusive of others, their opposites ; and, secondly, when permanent, persistent and irreversible tendencies and aptitudes are formed. In connection with habitual actions there must of course be habitual intellectual associations. These may be formed by repetition in the individual life or by hereditary transmissions. And when our minds are occupied with the habitual associations connected with our acts, it need scarcely be remarked that other things about which it was possible to occupy our minds are excluded. As one line of association is established, it is more difficult to establish lines in other and opposite directions. Out of this fact grow the differences among men in aptitudes and character. A man accustomed to an agricultural life forms his trains of thought upon the incidents of that life, and is largely destitute of the associations of the scholar;

indeed, after a time he is wholly unable to form those associations. The artist is not a reasoner; the lawyer is not a physician; the blacksmith is not a broker; the merchant is not a teacher. Where a person has an ability to turn from one thing to another readily, it is at the expense of that strength of association which is necessary to perfected skill. This truth is expressed by the common saying, 'Jack of all trades and master of none.'

§ 6. Some associations are absolutely exclusive. We cannot think of the presence and absence of an object at the same time; that is to say, there is no coherence between the ideas. We cannot form the idea of a square circle because there is mutual exclusion in the associations of a square and a circle, so that when we think of a square we destroy the idea of the circle, or conversely. We cannot imagine pain and pleasure as existing in our experience at the same moment; they must appear in succession, and one submerge the other. Accordingly associations which bring up irresistibly the idea of a square or of a pain are incompatible with and exclusive of those which bring up the idea of a circle or a pleasure.

§ 7. A further consequence of redintegration is the formation of inseparable associations. From all inferior degrees of strength of coherence, associations grow to an absolute inseparableness, so that in the mental life there is no capacity to reproduce one element of the association without raising the others. Thus all mental experiences tend to become involuntary and indeed to go out of consciousness finally, leading to unconscious redintegration and action. The beginnings of this machine-like action are seen in the formation of inseparable associations, either ancestrally or experientially organised. These associations occur throughout our experience. In walking, for instance, the intellectual associations of a relatively erect posture (in man), of putting one leg before the other, of the measurement of distance are inseparable. No one is thought of without the other, in the idea of walking. The localisation of sensations gives rise to innumerable inseparable associations; taste and the tongue, smell and the nose, sight and the eye—all have an indissoluble connection. The statical attributes of body we have seen to be inseparable from the idea of body, or of anything whatever in the external world, so much so that we cannot think of space except we invest it with force-attributes. In the use of language we constantly find names inseparably associated with certain objects. A certain figure or

expression of countenance always recalls the name Shakespeare, Kaiser Wilhelm, or my neighbour John Smith. Very often there is an indissoluble association between a name and some of its connotations. *Honesty*, *Justice*, *Chastity* as abstract names have certain inseparable connotations with most men. That the associations are inseparable we indicate when we say that *this*, *that*, and the *other* are *necessary* to honesty, justice, chastity, etc., and that the contrary is incompatible with those qualities. The logical distinctions of the schoolmen—*genus*, *species*, *differentia*, *proprium*, *accidens*—are founded upon the degrees of association. *Genus* and *differentia* are said to be of the essence of the subject, that is to say, the associations which are inseparable from the subject are those which make up its *genus* and *differentia*.

§ 8. Our reminiscences are full of inseparable associations. That which we term certainty and permanence with regard to memory is a matter of inseparable association, in proportion as the certainty is of a high degree. The sequences of events are often united in this way; night following day and day following night, motion followed by resistance, and resistance followed by motion are illustrations. Those associations indicated by relative names are remarkable instances (Chap. IV. § 24). The whole of our mental acquisitions permanently preserved involves inseparable associations. Habits which become inveterate and uncontrollable furnish instances when we consider their intellectual side; not less controlling and inexpugnable are ideas and opinions. Childhood and youth are the periods when the lines of associations take their direction; in early manhood and womanhood they crystallise rapidly. When a person 'ceases to learn,' as it is said, we indicate that those associations are becoming inseparable which relate and are necessary to the determination of character. No man during his life ever actually ceases to learn, but the lines in which he is to make acquisition are marked out generally some time before he reaches middle life. Men do not very materially modify their habits of feeling, thought, or action after that period.

§ 9. While it is true that some associations may be inseparable which are not at all so in another, and that the total set of associations inseparable united in one person's mind differs very materially from the total set of another's; yet there are some associations of this sort which are common to all people as products of all experience. These are expressed both in the universally settled laws of nature, such as the law of gravitation and in the

minor uniformities which universally control daily practical life, as the association between eating and satisfying hunger, food and sustenance of life. The highest and most complete exemplification of inseparable associations is found in what are termed axioms and necessary truths. (Chap. XXXIX. § 32, 33, and Chap. LVIII. *post.*)

CHAPTER XLV.

EMOTIONAL DEVELOPMENT.

§ 1. In our exposition of the Genesis of Feelings (Chap. XXVI.) we commented upon the difficulty and the impropriety of making mutually-exclusive divisions of feelings on the basis of any antithesis between sensation and emotion. The latter word is convenient to indicate the higher developments of feeling, but to attempt to make a classification of the emotions as distinct from the sensations is dangerous to scientific truth and accuracy. We mean by emotions more or less highly representative feelings arising in response to central, rather than peripheral, excitation. And in this chapter by Emotional Development I intend to indicate development of feeling. If *feeling* had an adjective it would be the preferable word; but in default thereof, *emotional* is the best term to use.

§ 2. Near the end of Chapter XXVI. was given a scheme of the points necessary to be examined in the full scientific treatment of states of feeling. This involved bodily origin and expression, quality (pleasure, pain or indifference), modes of presentativity, quantity, volitional and intellectual relations. In one sense these last named may be said to include all the rest, for we must remember again (Chap. XXXVII. § 14) that it is only our knowledge of feelings with which science has to do. Cognition is the index of feeling. This circumstance, and the fact that cognition and feeling are inseparable phenomena of consciousness, makes it necessary that the study of emotional development should follow along the line of cognitive development. Hence the value and importance of the division of feelings according to their degree of representativeness running exactly parallel to a corresponding division of cognitions.

§ 3 The leading subjective characters of feelings relate to their

quality as pleasurable, painful, or indifferent, the latter indicating states of excitement neutral or indistinguishable on this score; such as accompany acts of attention from external impact before a pleasurable or painful quality is declared. As feelings are represented they are represented as pleasurable, painful or indifferent, the tendency being to represent the pleasurable. As redintegration goes on, feelings attach themselves to the integrations formed, and the representative object is marked by a quality as respects pleasure and pain. Certain representative cognitions have pleasurable, agreeable, desirable accompaniments; others the reverse; with others there seems a neutrality. Thus ends of action are produced toward which volition moves.

§ 4. The development of feelings hence necessarily involves very prominently the formation of redintegrated aggregates which are attached to, and marked by, cognitive redintegrations, and which have their bearing upon volition according to the law of pleasure and pain. The development of feelings, therefore, has its chief subjective interest in the development of pleasures and pains, a full treatment of which will occupy our attention in Part VIII. of this work, pleasures and pains being regarded as the integrations of feeling.

§ 5. The proper classifications of feelings are one showing the progressive development of pleasures and pains, and also one exhibiting the relations of feelings to ends of action as concerning the individual and the race. Feelings have their subjective side as pleasure and pain, and also directly control volitional action. The classification of the emotions has always been a stumbling-block to psychologists, not from any want of acuteness or thoroughness on their part, but from the inherent difficulties of the subject. The complexities of these highly representative feelings, both as respects their composition and their relations to each other, and to other elements or aspects of mental life, are so great that we can scarcely analyse them, while to define them seems an impossibility. Except we follow out the orders of classification just referred to, we can only make irregular groupings of feelings having a tolerable degree of homogeneity, but not being mutually exclusive in all cases. For the purposes of this chapter, we will pursue the latter course, what we have to note at present to be supplemented by the subsequent exposition of pleasures and pains, and ends.

FEELINGS OF ATTENTION.

§ 6. When the attention is fixed upon any object, there arise certain feelings, more or less representative, which are apt to be neutral as respects pleasure and pain in the first instance, though soon assuming a pleasurable or painful character. The characteristic feature of these emotions is the transition from one state of consciousness to another; the feeling of change, which is in itself pleasurable, though the pleasure may be quenched very speedily if the new object awakens pain or painful associations. There are various forms in which these emotions appear.

§ 7. *Novelty.*—Where a sharp contrast is presented between the new state and the old, and when the new with its associations continues to exhibit the same contrast with the old and its associations, the emotions attendant upon novelty arise. As we have heretofore seen the feelings of contrast, the rise of a novel feeling detaining the attention, depend upon quantity of sensation or pleasurable interest. Novelty is very largely pleasurable, but a novelty in pain is apt to create a stronger feeling than an accustomed pain. Observations have been made with a view of determining how small a difference of sensation-creating force can be perceived. The result of these observations has been expressed in what is termed Fechner's law, which assumes that the smallest perceptible difference is constant within the range of the same sense. This law is as follows: '*The increase of stimulus necessary to produce the smallest perceptible change in a sensation is proportional to the strength of the stimulus already acting;* or, *the sensation increases proportionately to the logarithm of the strength of the stimulus.*' The heavier the pressure upon the skin, for example, the more must it be increased or diminished in order that the increase or diminution be felt. If a lighted candle is brought into a dark room, a sensation of light ensues, which, however, is not doubled by the addition of a second; and if a third is then added, the sensation is hardly increased at all. The law is an approximately true expression for sensations of medium intensity.[1]

§ 8. *Variety.*—When there is a remission or intermission of the stimulating cause, the effect of novelty is produced, on a recurrence. The longer the interval of intermission the more lively the feeling when it recurs.

[1] See Martin's *Human Body*, Chap. XXV.

§ 9. *Monotony.*—The feelings of novelty, of course, are greatest at the first shock. Continuance of the impression blunts the feeling, and in the case of pleasurable novelty, the pleasure rapidly degenerates until finally there arises the pain of monotony, producing fatigue and dissatisfaction. An extreme form of this is Ennui, which may result from the cutting off of accustomed pleasures or from satiety in the enjoyment of them.

§ 10. *Surprise.*—This emotion occurs when there is a sudden, unexpected experience of something new. The physical expressions are often very marked. The eyebrows are raised ; the eyes are opened wide, and the mouth has the same tendency ; the movements of the heart are accelerated. Surprise may be either pleasurable or painful. There is always a feeling of contradiction or opposition in this emotion which is not, however, sufficiently acute to produce a very positive pain.

§ 11. *Wonder.*—When to surprise is added the feeling of a something above common experience which elevates the mind and gives an impression of superior power, we have astonishment. Sometimes there is an infusion of fear, giving rise to awe. Sometimes anger is blended with the surprise, creating contempt or loathing. Again, if to the wonder is added a feeling of approval, admiration supervenes. Wonder is involved in sublimity also. The emotion is far reaching and pervasive.

§ 12. *Interest and Effort.*—Pleasurable attention is often indicated by the word *interesting.* We are attracted, detained, interested in something which thus claims our attention. On the other hand, voluntary attention is often attended with the feeling of effort, as when we labour painfully to fix our minds upon some task. These are the experiences of every one, especially in childhood and youth.

FEELINGS OF SELF-SUFFICIENT ACTIVITY.

§ 13. Self-activity being necessary to the development of life is in itself pleasurable. As we shall hereafter see, this activity is a self-sufficient end. Representations, then, of experiences which are of simple self-activity, without regard to purposes, often generate pleasurable emotion. Especially does this occur when, under present restraint, the pleasures of freedom are more vividly represented. The emotions of power, as conferring the ability to carry on activity unhindered, involve an element which comes

from the feelings we are now considering. In these ... enjoyments of *play* are the characteristic feature, the ... mere activity for its own sake. Feelings of self-activity ... connection with bodily activity, as in movement and ex... all the varieties of sports for instance. They also arise ... tion to all the sorts of mental activity. The delights of ... in recalling past events are indisputable. But most consp... do these pleasurable emotions arise in the exercise of int... constructiveness. Among these are the pleasures of the i... tion. The inspiration to this form of mental activity is ... found in the play-impulse. In addition to the above-men... those feelings which prompt to development and progres... their roots in this group.

FEELINGS OF ACTIVITY FOR ENDS.

§ 14. Closely allied to the feelings of self-sufficient ac... are those wherein the activity is directed to ends. These ... very largely the pleasures of hope and anticipation. We ... forestall what belongs to a subsequent chapter further than ... that these ends have their chief division into Egoistic, Ego-Altruistic, and Altruistic. Egoistic ends do not take into ... the pleasures or pains of other individuals than self; the ego-altruistic take into consideration the feelings of others, but ... as ultimately affecting self; the altruistic are those having the purest regard for the pleasures and pains of others, embracing the most disinterested feelings. This classification applies to pleasures also; all ends are pleasures.

FEELINGS AS RELATED TO STATES OF THE ORGANISM.

§ 15. The feelings we have now touched upon relate primarily to activities of the sentient being. There are many feelings and emotional states which may be referred to conditions of the organism. It is impossible to define these feelings, or to say whether they are to be considered as ento-peripheral or as central feelings. So far as they are not sensational, they are usually indicated by synonyms for pleasure and pain, such as, on the one side, Exhilaration, High Spirits, Hilarity, Joy; and on the other, Dejection, Sorrow, Melancholy, Prostration, Despair. Of course the causes of these feelings are often found in the exercise of activities outward, and in the action of external things upon the

organism. I now merely refer to them considered as primarily related to the organism itself. They are forms of pleasure and pain—feeling on its subjective side.

FEELINGS AS DEVELOPED BY ENVIRONING OBJECTS.

§ 16. No feeling is independent either of organism or environment. All feelings attendant upon efferent activity imply an environment upon which action is wrought; in like manner, all feelings generated through environing forces postulate a reaction of the organism. Nevertheless we can classify feelings according to their primary relations, thus giving less prominence to, though not ignoring, secondary implications. In this view, having referred to the development of feelings by automatic activity, and also having adverted to their development by conditions of the physiological environment, it remains for us to consider emotional states as developed by the external environment, and as related primarily to external objects and representations of the same. These states, so far as the objects are concerned, result in attraction or repulsion, on the subjective side of which we find as corresponding, pleasure and pain, with a point of indifference or neutrality, both on the objective side and also on the subjective. We shall then have emotional states as primarily related to external objects divided into two grand divisions, (I.) Pleasurable Interests in External Objects, and (II.) Aversions to External Objects. Under these heads we will examine some of the leading emotions.

(I.) PLEASURABLE INTERESTS IN EXTERNAL OBJECTS.

INTEREST OF INTROSUSCEPTION.

§ 17. The introsusception of external objects for assimilation with the organism must be one of the earliest experiences of conscious life, as it is one of the very earliest functions of all organic life. The experience occurs in connection with the gratification of appetitive cravings, those of alimentation perhaps being the most prominent. When, therefore, the representative power is sufficiently developed to connect with any object, either perceived or remembered, the associations of pleasurable introsusception, an introsusceptive interest is awakened, more or less strong according to the conditions of appetite then subsisting.

The animal, upon sight, hearing, or smell of its prey, has developed an emotional interest to devour it, if hunger presses; if there is no immediate urgency, still there is some representative pleasurable interest of gratified hunger which attaches to the object. A similar effect comes from the sight of water; a similar one from the thought of the sun at night time as representation is further developed; from every object which has associations of appetitive enjoyment, whether animate or inanimate. There are feelings aroused in the animal at the sight of one of its kind which are not created by the sight or thought of its prey; of these I shall presently speak. But so far forth as the creature is viewed as prey, it seems likely that the same sorts of feelings arise as at the sight or thought of the inorganic water which is to quench thirst. Before any feeling of malevolence comes there will be simply the feelings accompanying a desire to eat the object which experience has taught the animal will satisfy hunger. These interests of introsusception, thus generated, mark the beginnings of the formation of ends.

INTEREST OF PURSUIT.

§ 18. The introsusceptive interests almost immediately develop the pleasures of pursuit, which furnish an additional source of emotional variety. Objects of interest for introsusceptive purposes to be available must be taken and thus often pursued. Besides the represented pleasures of introsusception, there are added the pleasures of the exercise of automatic activity. The element of uncertainty as to success increases the pleasure, unless the end is so desirable and its attainment so urgent as to create fear or anxiety with regard to loss or failure. The fact that activity is an end in itself receives illustration in this connection from the circumstance that the pleasures of pursuit are oftentimes regarded as superior to those of acquisition. Where pursuit, however, is undertaken in obedience to any very strong urgency, except that of exercise, this cannot well be the case.

INTEREST OF ACQUISITION.

§ 19. Following hard upon successful pursuit is the pleasure of possession, and with it goes that of acquisition. Although a thing may not be immediately necessary for enjoyment, the fact that appetitive cravings may go for a long time without the means

of satisfying them, creates a prevision and providence, which though short-sighted in the inferior degrees of life and also in primitive man, yet, as development of the representative faculties goes on, becomes very far-reaching. Thus an object may be desired not for present use but for future consumption, and hence the genesis of love of property. The interests of acquisition and accumulation become as ends very strong, very persistent, and very absorbing. They constitute a large fraction of our representative pleasures. The emotions aggregated on this basis involve a sense of novelty, security, self-complacency, and power; they bring out a pleasure in forethought, calculation, and prudence; they are interwoven with all pleasures of labour, and in fact reach into every mental department. When not balanced by feelings more altruistic, they exist in forms designated by the terms *avarice*, *covetousness*, *greed of gain*. The pleasures of power are very closely related to those now under consideration. The mastery of a situation, especially in commercial states, is often attained and secured by means of a person's acquisitions. This is not always the key to power, however, and the pleasures of acquisition and power are therefore not wholly co-incident. The interest of acquisition relates also to animate beings for the purposes of service, as with domestic animals and with slaves.

INTEREST OF PRESERVATION, DEVELOPMENT AND PERFECTION.

§ 20. The same forethought which takes note of future exigencies makes it an object to preserve the things we have got. This involves care and solicitude, and some comprehension of the conditions of the existence of what we desire to preserve. Our attention is hence directed toward these objects with a view to their preservation, and the rise of ego-altruistic feelings occurs. This interest is readily extended to the development and perfection of external objects. A plant is preserved and cultivated for its fruit, and we note with pleasure its growth; an animal is kept and fattened for future eating, and we are interested in having it well taken care of. Shelters are built, food and drink supplied. When a society comes into existence, the interests of preservation as between man and man become greatly complicated.

INTEREST OF BENEVOLENCE.

§ 21. It is but a step from the last-named interests to those of benevolence in its initiation, though for its full development

some regards not yet noticed are necessary. An object having life, the preservation, development and perfection of which is a matter of interest to us, we cherish with some degree of benevolence. The term can scarcely be applied to inorganic objects, nor yet with full propriety to vegetal life. It seems to designate a regard for the welfare of an animal, and is the more certain and pronounced as we invest such a creature with feelings like our own. We are thus brought to the

INTEREST OF SOCIETY.

§ 22. I have already mentioned among the appetites that of Society (Chap. XXX. § 36). There is a pleasurable interest in the amicable presence of another being like one's self. This occurs in connection with the gregarious position of conscious beings, so situated as to be of mutual help and comfort. Warm contact, as protection against cold, combination for the purposes of overcoming and securing prey and of defence against enemies, are the primitive advantages. To these ends some sort of communication is necessary, and this established, the pleasure of likeness, agreement, community is superadded. When we increase these by the tender emotions, we have a mass of very powerful feeling. The interest of society, however, varies greatly under different circumstances. Mr. Spencer remarks: 'An animal of a predatory kind which has prey that can be caught and killed without help, profits by living alone; especially if its prey is much scattered, and is secured by stealthy approach or by lying in ambush. Gregariousness would here be a positive disadvantage, hence the tendency of large carnivores, and also of small carnivores that have feeble and widely distributed prey, to lead solitary lives. Others there are, however, as the wolves and their allies, which having large prey, profit by co-operation, and gregariousness becomes in part their habit. Among herbivorous animals, gregariousness is general, for the reason that the distribution of food is not such as would make dispersion decidedly advantageous, while certain benefits arise from living together; more especially the benefit that the eyes and ears of all members of a herd are available for detecting danger, and hence, on the approach of an enemy, each member of the herd has a greater chance of being alarmed in time to escape than if it were alone. Obviously, then, under such conditions as to food any variety of a herbivorous

species which had a tendency for its members to feed within sight of one another, would be the more likely to survive, and gregariousness would be increased and established. . . . Sociality having thus commenced, and survival of the fittest tending ever to maintain and increase it, it will be further strengthened by the inherited effects of habit. The perception of kindred beings, perpetually seen, heard, and smelt, will come to form a predominant part of consciousness—so predominant a part that absence of it will inevitably cause discomfort. . . . Clearly then, in a species to which gregariouness is advantageous, the desire to be together will, generation after generation, be fostered by the habit of being together. How strong this desire does become we see in domestic animals. Horses left alone are often depressed in consequence, and show themselves eager for companionship. A lost sheep is manifestly unhappy until it again finds the flock. The strength of the desire is, indeed, such that in the absence of members of their own species, gregarious animals will form companionship with members of other species.

'Without further evidence we may safely infer that among creatures led step by step into gregariousness, there will little by little be established a pleasure in being together—a pleasure in the consciousness of one another's presence—a pleasure simpler than, and quite distinct from, those higher ones which it makes possible.' [1]

SYMPATHY.

§ 23. The interest of society cannot be subserved without some ability to understand and enter into the feelings of others. In connection with the social instincts and necessities, therefore, we witness the birth of sympathy, which develops the disinterested or altruistic feelings of our nature. By means of sympathy we are enabled to understand the emotions of another being and act for that other as for ourself. That we do have purely altruistic feelings is certain, though many which we are in the habit of considering disinterested are in reality only feelings sublimated out of a prudent selfishness. There are, however, some actions so spontaneously and unequivocally unselfish that we cannot explain them on ego-altruistic grounds. The lives of heroes and martyrs furnish sufficient illustration. The peculiarity of the sympathetic emotions is the attaching of certain feelings relating primarily to

[1] *Principles of Psychology*, Part VIII. Chap. V.

ourselves to another personality, and having those feelings aroused by the circumstances of another person or being.

§ 24. In order to excite sympathy proper there is need of a considerable development of representative power. According to the range of his own experience will a person's sympathies vary. Of the general and common run of pleasures and pains every one has experience; but every one has his own peculiar experiences which are not common to others. Those experiences in which a person is rich and which he is best able to recall, are the ones with which he is best able to sympathise when they occur in another; those which another has but he has not had, he is not able to sympathise with except as by association he can picture them ideally. Therefore, a power of vivid representation of one's own experience is necessary to the creation of sympathy, and to this a ready constructiveness (projected representation) is a valuable auxiliary.

§ 25. There must also be an acquaintance, and some degree of familiarity, with the signs of feeling in others. The voice, its words and tones, the general and special expressions of the features, the attitudes of the body, gestures, movements—all need to be interpreted with certainty and distinctness. The associations of circumstances of all sorts and varieties must also be apprehended, as these often reveal the intensity and kind of feeling. The sight of an agreeable article of food in the hands of a person, of which article he is eating a portion, would be more potent to enable us to understand the pleasure which the person eating experiences, than the expression of his countenance. The accustomed social connections of an individual enable him to judge of the feelings of others. Knowing those about him, very slight indicia will reveal feelings which to a stranger could not be understood or interpreted by any such signs.

§ 26. There must also be a receptive as contradistinguished from an active disposition. A susceptibility to impressions from without is favourable to sympathy; an intense activity is in general unfavourable. It sometimes happens, to be sure, that to an active temperament is allied an ability to contract sympathetic feeling, there being a balance which renders this possible; but the tendencies are as stated. Mental activity tends to exclude sympathy by deadening the susceptibility to outward impressions of the feelings of others. In similar manner the defects of age, or failure of the senses, cuts one off from sympathetic feelings. A deaf person

is not usually sympathetic. The destruction of the hearing throws the mind upon its own activities, and renders it self-engrossed. Just so when by cultivation great mental activity is stimulated and expended upon interior reflection. Equally so when the activity is expended without. The unwearied strategist in the field of war or in the cabinet is not generally a man whose sympathies are controlling; nor is he who is carrying out practically the details of any engrossing course of action. The business man in his business life is not sympathetic; in his family associations he may be quite so. The feminine temperament is more favourable to sympathy than the masculine; and there is less energy among females than males; the former are essentially passive, not active.

§ 27. Similarity of character and life is important to particular sympathies. People who agree in opinion, whose tastes are alike, whose occupations are the same, who have mutual friendships, whose position and situation in society are the same, more readily sympathise on account of these facts. We have little sympathy for those who are very different from us, even of human kind, and still less are we able to arouse the feeling with the lower animals in the proportion that their differences from our nature increase. Difference begets antipathy, and is damaging to sympathy. Nevertheless persons of broad culture are able to fix in each other enough points of agreement upon which to preserve sympathy, though there are radical differences between them.

§ 28. Among the other counteractions to sympathy is found the controlling taste for selfish animal pleasures which another cannot share. The habit of allowing a predominance to anger and its associated feelings, the prevalence of intensely selfish desires of acquisition, avarice, love of power, all contribute to lower the aptitude for sympathetic feelings. It should also be noticed that general discontent, unhappiness or misery often destroy the power to sympathise with others. A man who is himself in danger of starvation has much less sympathy for a fellow in the same condition than has he who is well fed. This may be owing in a considerable measure to the fact that misery enforces the self-regarding emotions to an engrossing degree.

§ 29. Sympathy is pleasurable or painful according to the state of the one sympathised with; and hence sympathy may run through the whole course of feeling. Sympathy is not a special kind of feeling, but any feeling produced in harmony or agreement with

the feelings of another. If the object of sympathy be full of joy, the sympathetic feeling will be one of joy; if of pain, the sympathetic feeling will be one of pain. Sometimes the feeling of sympathy will be so powerful as to oppose itself successfully to the whole current of our general inclination, conquering entirely our selfish interests. The expressions of sympathy are the same as the expressions of the original feeling in the object sympathised with, though usually in a modified degree. This is seen in the infectiousness of laughter, of fear, of anger, of love. The origin of the feeling is clearly the interest of society, there being no way of securing the presence and assistance of others without understanding and ministering to the wants of others. The emotion is immensely exalted by the emotions I am now about to describe.

LOVE.

§ 30. The appetite of sex is the foundation for that emotion we call love, which in its highest developments is exceedingly complex. It is an individual interest with a race interest superimposed. The composite and highly integrated character of this emotion was illustrated in an apposite quotation in an early part of this work. (Chap. VIII. § 12). Soft, warm contact and the sexual embrace initiate the feeling. All the social, sympathetic and benevolent emotions contribute to increase it, while many egoistic interests coalesce with it. As indicated by its origin, its characteristic expression is the embrace. It is exhibited in the facial expressions, in the lachrymal, mammary and other sexual secretions, in postures of the body, in turgescence of the sexual organs, in sobbing and sighing, and sometimes in laughter, though as to the last not in the more intense forms of tenderness. Generally speaking, its effect is to reduce movement and put the body into a readiness for the embrace.

§ 31. Exaltation of the sympathies is one marked characteristic of tender emotion. Sympathy may exist without love, but not love without sympathy. Tender feeling involves an extension and enlargement of sympathy, with some things added not found in sympathy alone. The æsthetic emotions and susceptibilities are of value in stimulating love. So also where situations exist of pain, sorrow combined with helplessness, tenderness is excited. The antipathetic and self-regarding feelings are generally unfavourable to its development. Arising from the bi-sexual character of

sentient beings and the interest of sociality or gregariousness, together with interests of acquisition and preservation of what is desirable, there have been generated and perfected, through numberless associations, representations and consequent modifications, the great emotions of tenderness, love, sympathy, and benevolence generally: being a mixture in different and varying degrees of selfishness and disinterestedness, and having balancing and opposing tendencies as they aim, on the one hand to promote the special and paramount welfare of the individual, and on the other the interest of the race. Thus there is evolved the sentiment of an organic connection between communities of individuals, the advantage of the one and of the whole being in the result best subserved by measured, limited, and balanced promotion of the interests of both.

§ 32. *Sexual Love.*—The power of this form of love is probably greater than that of any other emotion. In vehemence of manifestation sometimes it is equalled or exceeded by anger, but in point of continuance and endurance the latter is far inferior. A distinctive peculiarity of the emotion is the tendency to concentrate its regard upon one object. This arises primarily from the fact that the sexual embrace is practicable only with one other at the same time. The intense feelings excited are gratified with and directed toward one only. As, then, the superadded emotions come on, they receive a direction toward a single object. Moreover, the difficulty of satisfying sympathetic and benevolent purposes toward a plurality of objects of love, and on the other hand the diminution of benefits received when they are divided, enhances the propriety of and natural adaptation to single affections. The more the regards are distributed the less intense and full are the joys of all kinds. The aim of love is hence union of body and mind, identification, so far as possible, with the one object of affection. In the beginning, this union is temporary, perhaps momentary; but as the representative feelings are developed the tendency is toward concentration, and continued concentration upon one object. Of course there are hindrances to this, arising from uncongenialities of various sorts, as well as from the interests of variety and novelty. Yet everywhere concentration is favourable to intensity, and intensity implies concentration. There are so many intense pleasures involved in sexual love both real and ideal, and so many that arise from continuance of the relation,

that as the emotion grows more representative it tends to become more exclusive in its objects.

§ 33. *Parental and Filial Love.*—In the love of parent for child and of child for parent occurs another form of tender emotion sometimes thought to be more powerful than that of love between the sexes. This also takes its rise from the pleasure of the embrace, as seems probable, combined with feelings arising from helplessness on the one side, and power to protect on the other. Helplessness wherever it occurs seems to suggest and awaken tender emotion. The most intense feeling of pleasure accompanies the embrace by a mother of her newly-born child. This is enhanced by the pain she has just passed through, by the inconveniences and anxieties of the prior period of gestation. On the part of the child the feelings of dependence, and the satisfaction in the mother's embrace, are sufficient fully to account for the birth of the emotion. On the part of the parent, in addition to what has been suggested already, the feelings arising from the personal beauty of the infant, the pleasure of observing congruities and likenesses in the diminutive form, reproductions and suggestions of what has been loved before in husband, wife, or less intimately connected person; the sense of ownership, and the associations of hopes and longings for the future of the child, giving large scope to the intellectual activities—all tend to augment and intensify the parental feelings. The sympathetic emotions in connection with the parental situation are manifested more strongly in the mother than the father. The egoistic emotions relating to power, property, self-gratulation are seen in the father more prominently. A part of the love for his child comes also from sympathy with the mother and for her trials and cares. While it is undoubtedly true that the full fruition of parental love is never obtained in caring for a child not one's own, yet a considerable degree of the emotion will arise toward the adopted child, and some degree toward the children of others temporarily in one's care and presence.

§ 34. In the different relations of the family we have various extensions and modifications of parental and filial love. Brothers and sisters love each other through their love to their parents, through the community of interests subsisting between them, and through all the cultivated sympathies of the family. In a less degree the same feelings are extended to more remote relations, varying according to the characters of persons and the different

circumstances of propinquity and mutual advantage, until at last they merge in the emotions of simple friendship.

§ 35. *Friendship.*—This is a specialised form of sympathy and tender emotion, where regard for and interest in others is concentrated, in a degree higher than usual, upon some favoured individuals. When in a particular individual there exist collected those qualities which attract us from their ability to satisfy wants in our nature, we have friendship for that individual over and above our common feeling. If we are receiving great benefits from a friend and our interests become identified with him, the ties which bind are much strengthened. Hopes, desires, plans, purposes unite upon him, and he becomes a part of our life. Or, if he need our assistance, our protection, our good will, the fact that he is weaker and we are able to support and aid him, increases our tenderness toward him and we cleave to him. Both the selfish and the disinterested feelings have play in the associations of friendship. If there be simple congeniality and reciprocity of kind offices and agreeable connections, the friendship will often be very strong. Unity of purposes, tastes, and sentiments produce great friendships, as also does the concurrence of trials, occupations, and responsibilities where there is also personal agreeableness.

§ 36. *Pity.*—This is a benevolent emotion, consisting chiefly of pleasure in helping the helpless and a desire to relieve distress. It is probably derived from the parental interest. It is generally more active toward the young and the weak than to the strong when in distress. Yet it exhibits itself as sympathy with pain wherever pain is seen, varying, of course, with the sympathetic character of the individual pitying, and often with the attractiveness of the object pitied and the degree of misery exhibited.

§ 37. *Gratitude.*—The emotions of gratitude take their rise from the reciprocal pleasures of the embrace. This is not in itself an intelligent joy of contributing to another's pleasure because of pleasure received, but a blind feeling of satisfaction to one's self in reciprocating pleasure bestowed. Yet as soon as representation increases enough to make us appreciate another as the cause of benefits and joy to us, the proper emotions of gratitude arise, and we are sympathetically affected also by another's pleasures and pains. The emotions of gratitude exist in their fulness on the part of the child toward the parent, between lovers, between husband and wife, and between friends. They are also

seen in different degrees arising toward those who confer on us any benefit, toward one's country, city, or society, toward the lower animals, and even toward the beneficent forces of nature, giving rise to some ideal pleasures. The tender element is seen in its greatest manifestation where the person to whom gratitude is felt is lovable and agreeable, from causes aside from those creating a present specific grateful feeling. The gratitude extended to a distant benefactor whom one has never seen, perhaps, is a much less strong feeling than that felt towards a near or present friend. There is a wide range of variation in the case of these, as well as of many other emotions, which are always marked by the same name.

§ 38. *Sorrow and Grief.*—These are varieties of tender feeling occasioned by the removal of some person or thing, an object of affection, embracing egoistic feelings of the loss, and sympathetic interest in the fate, which befalls others. It may occur when we are disappointed in not attaining that which we had hoped for, and may accompany almost any pain. Not every pain brings at once the emotion of sorrow, but almost every pain, after its first shock, excites and draws out tender emotion in the form of sorrow. The most poignant griefs are the most sympathetic, and are illustrated most conspicuously in the death of loved ones. The disappointments of ambition, the failure of cherished plans, the disabling effects of sickness, the misfortunes of others, the general misery of the world, suggest familiar causes of this emotion. The most notable expression of sorrow is weeping and its accompaniments. It is not the case that this emotion is wholly painful. The 'luxury of grief' is undoubtedly a pleasure, the enjoyment coming from the tender feeling excited. The thought of a dead friend arouses pain at his absence, and the desire to bring him back causes a reaching out for him as if to embrace him, which is attended with a gush of love producing a whole series of pleasurable representations, containing many associations of a very agreeable character. Tennyson's 'In Memoriam' gives an excellent illustration of the mingled pains and pleasures of grief.

§ 39. *Esteem and Admiration.*—A form of tender emotion is expressed in the words *esteem*, *regard*, *respect*, *admiration*, although other emotions are commingled. When we approve of a person's life and character, we experience for him a tenderness which is sometimes indicated by the word *appreciation*. We cherish it toward those who live honourably and do their duty,

though we may not have any personal acquaintance with them. Admiration contains an element of wonder. 'The emotion of esteem is a reflected or associated feeling, growing out of our sense of the mischief prevented and the good achieved by the performance of the social virtues. Knowing well the miseries that accrue from neglect and carelessness of every description, we feel a lively and cheering sensation of relief from an opposite kind of conduct which easily passes into a certain tender regard toward the persons.'[1]

§ 40. Tender emotion also exists in a degree with respect to inanimate objects by their investiture with the associations of sentient being. We may love a tree because it awakens personal associations of an agreeable character. This ideal love may be awakened and fixed upon persons whom we esteem and admire only from report of their deeds or from reading their published works, the emotion rising above that of esteem and admiration. A similar tender feeling may exist toward the constructions of the imagination, to which we have come to attach the associations which surround personal objects and awaken tender emotion. Characters of fiction excite affectionate regard. We even personify virtues, and have feelings stimulated by the mention or thought of them similar to the tender feelings we have for individuals. Love to God is an emotion of this sort, and can be educated so as to become very powerful as the mind accustoms itself to associate with the idea of God its dearest and most precious interests.

§ 41. Love is not an unmixed pleasure. Fears and anxieties detract from it, inasmuch as the sympathies are greatly quickened and heightened by the presence of the emotion. Moreover, when sternness is required, and antipathetic emotions are more favourable to the accomplishment of a cherished purpose, if tenderness steals over a person, it is distasteful and disagreeable; and an effort is at once made to expel such emotions from the mind.

SYMPATHETIC REGARDS FROM OTHERS.

§ 42. Not only do we take pleasure in sympathy and love in all its forms directed towards others, but we have many pleasurable emotions arising from the favour of others. Among these are the emotions comprised under the head of:—

[1] Bain's *Emotions and Will*, Chap. VII.

§ 43. *Self-Esteem and Self-Gratulation.*—They arise when we transfer to ourselves the associations of esteem, sympathy, and general appreciation with which we regard others who please us. They are more than the mere emotions of pleasure occurring when we are satisfying some appetite or desire. These latter are simply gratifications coming from appropriation of the good things of our experience; the others involve the relations of society. They would not exist in the case of a single individual, isolated from his kind. They begin with the earliest comparisons of ourselves with other people. We see others receiving pleasures, rewards, good things, and consider ourselves by comparison worthy of the same, similar, or greater good. Associated with these feelings are our desires and appetites, and as both classes of feelings grow stronger we may fall into an inordinate conceit, so that we feel ourselves of greater importance than most of our fellows. Where we indulge the habit of contemplating our own condition as one of misery we have an emotion of self-pity and commiseration which often induces melancholy and distress. When we pity others, there is the feeling of tenderness, itself pleasurable, and a feeling of approval of the object pitied. When, therefore, self is made the object of these emotions, it is easy to see how the pleasurable elements may not only be manifested there also, but even intensified. Self-gratulation and self-complacency exhibit habitual emotional states of pleasure and satisfaction arising from regarding ourselves as worthy of honour and benefit. When, however, complacency arises from contemplation of what one *has*—property, good position, honour—there exist the pleasures of possession, in themselves giving a sense of comfort, ease, and enjoyment. Self-respect is an emotion of a higher order. In this feeling is involved the idea of being worthy of respect by doing something for others, and fulfilling one's destiny by worthy effort; it is a feeling that one deserves well of his fellows because he has done well by them or tried to do well. The best form of pride has a similar composition. When the feeling of deserving well because of good deeds or intents is absent, the emotions and their consequents take the form of arrogance, determination to carry one's point by force or influence whether deserving or not, unworthy pride, haughtiness and insufferableness. Sometimes a feeling arises in which a man feels an independence of all others and which may lead to an ability to stand against others. This may be self-respect or it may be arrogance, according to its sources and circumstances. All the

emotions now under consideration are prevailingly pleasurable, as are all self-occupying or self-regarding emotions. If they become painful by reason of any associations, they are driven out of the constitution, or, if tolerated, it is because they are changing to pleasures. Self-humilation, for instance, is a painful feeling at first, but may become highly pleasurable. The physical expansion of all these emotions is chiefly marked in the countenance and carriage, but is not violent.

§ 44. *Approbation and Praise.*—The pleasurable emotions which come from the approval of others proceed entirely from the social condition; the intensity of the feeling is largely governed by the degree of our dependence upon our fellows, or our estimation of such dependence. Sometimes it is associated closely with self-gratulatory emotions, and becomes inordinate. Frequently there is an intoxicating effect proceeding from applause and honour, which is very sweet. The feeling of being admired enters into this pleasure, and is something more than the meer enjoyment of approbation; it is a blending of the latter feeling with self-complacency and the similar emotions just described. In connection with the pleasures of praise arise those of power, ideal longings and hopes for the future, stimulated activity, benevolence, condescension, magnanimity, and many other emotions æsthetic and utilitarian; here, indeed, we have another striking example of the vast complexity of emotional states. Pleasure arising from flattery implies an excessive fondness for praise and a diminution in the elements of self-respect. Vanity is another case of pleasure coming from praise where the balancing regard for truth and propriety is absent. But praise does not always produce pleasure. Over-praise, gross adulation, extravagant ascriptions in a well-balanced mind produce pain in the form of disgust, sickening, loathing, contempt, and even anger or fear, the latter when evil effects are apprehended from jealousy and envy. Coming under the present head are the pleasures arising from the courtesies of life, expressions of respect and deference. Physically, all these emotions have expression in the countenance and attitudes of the body, the expression varying according to the predominating element, the general effect being sedative or to produce mild exhilaration. They are readily revivable, and form some of the most persistent of our ideal emotions.

§ 45. *Reception of Gifts and Benefits.*—Akin to the pleasurable emotion of experiencing approbation is that of receiving a

gift, a benefit, or even good news. We are gratified not only in our self-complacency, but also in our actual needs. Something is added to our sum total of sources of happiness. In the emotion, novelty, surprise, gratitude, love of property, self-complacency, all occur.

INTERESTS OF GENERAL EGOISTIC UTILITY.

§ 46. In general, whatever object by reason of past experiences or associations appears to be useful for any end relating to egoistic development, is invested with a pleasurable interest to the mind. Anything which promises to contribute to my happiness is more or less pleasing, and will awaken greater or less desires according to its relative value. Thus things capable of being reduced to possession become interesting. In like manner, courses of conduct and action, involving all the relations of self to others and to inanimate objects, commend themselves to us because of their utilitarian bearings. As representation is carried to its higher degrees, general notions and principles act as stimuli to volitional movement through the feeling that they awaken as representative of former experiences. This goes so far as to create remote ends which are controlling on conduct for long periods of time. A vast number of interests are comprised under the general interest of the useful to the individual, even the altruistic interests themselves, in a measure. These emotions culminate in the pleasure of self-development, superiority, command, self-aggrandisement and power generally, together with wealth, reputation, fame and the like.

INTERESTS OF GENERAL ALTRUISTIC UTILITY.

§ 47. These interests relate to the happiness and welfare of others, as organically united with ourselves, and embrace the moral and ethical emotions. But since these last include aversions also, we will treat of them in a class by themselves after we have considered the sources and varieties of aversion. Aside from altruistic interests not properly ethical, there is that added interest in things coming from the fact that they are of general utility. The pleasures of preservation, development, and acquisition are often altruistic. In view of a famine in Persia, we are interested in the production of good grain crops near enough to relieve it. Works and institutions of charity commend themselves to us on

the same ground. Educational interests are held of great importance. Good government and the promotion of the common weal, the preservation of the peace and of personal liberty—all have a great degree of importance to the society, the community, the state, the race. All these last, however, are closely related to the ethical interests, inasmuch as they concern the acts of one man in relation to others with regard to the public or common weal. The comparative values of altruistic and egoistic interests we shall have opportunity to examine in a later chapter.

ÆSTHETIC INTERESTS.

§ 48. Not all of our interests are utilitarian. Many things are pleasing for their beauty alone, irrespective of considerations of utility.

There are certain pleasurable emotions termed æsthetic which have characteristics separating them from other emotions in some degree, not, however, because of any difference in kind from other classes of emotion, but because of a difference of quantity and arrangement of the component parts. There is supposed to be a contrast between the Beautiful and the Useful, by which two great classes of emotions are distinguished. It is important, then, to observe the marks which may be placed upon the æsthetic emotions that they may be known and recognised. Those marks seem to be of three kinds; first, the æsthetic emotions arise in connection with objects which are not present for the purpose of ministering to our necessities; secondly, they arise in connection with objects which are without disagreeable accompaniments; and, thirdly, with objects whose enjoyments are not restricted to a single mind. In pleasures, a distinction is made between sensual and æsthetic, corresponding to the antithesis of the useful and the beautiful; and examining these two sets of delights, there will be discovered illustratively the leading points of difference which have just been given. Taking, for example, the enjoyments of eating and drinking, we may observe that they are pleasures existing in connection with functions having for their chief end the support of our lives. They are sensual pleasures associated with useful operations, the usefulness being the groundwork of the whole. Attending the accomplishment of eating and drinking, there is much that is disagreeable, and many unpleasant suggestions. Digestion in any of its processes is associated more or less with

disgusting attendants. And, in the third place, there is no community in the pleasures of eating and drinking in themselves. No one but the one eating enjoys the morsel of food. There are some superadded associations, as the sociability of feasts, which introduce community of enjoyments. These, however, are different from the simple sensual pleasures; the latter subsist independently of the other. Proceeding from this illustration, and taking up any of the activities of mind which are termed useful, there will be noticed the same leading characteristics of being conducive to the supplying of our necessities, of having much unpleasant connected therewith, and of being essentially concerned with the individual in the matter of enjoyment. Labour of any kind, whatever pleasures it affords, has the same disadvantages of restrictions and counteractives of these sorts; this is true of mental as well as bodily toil. The emotions connected with wealth and power are both exclusive and limited, as they commonly exist. With the ordinary existence of irascible emotions there is usually very much that is painful. Fear is characteristically a pain. Even tender emotion gives rise to envy and jealousy, and is not an emotion that is extended in its scope or capable of being shared by many. But when, in the course of human experience, out of the activities, the thoughts, the feelings of daily life, there arise associations connected with which are emotions freed from the unpleasant and disagreeable, capable of being diffused and shared by all alike without detracting from the pleasure of the possessor, having their end in pure gratification apart from any utility, the domain of the æsthetic is reached. These emotions may be sublimated from almost every class of fundamental feelings. In the ideal contemplation of a sensual pleasure, an æsthetic delight is obtained which has its basis in the reality, but from which all that is unpleasant in the actuality has been eliminated. As thus transformed, it has no connection with our necessities, and is capable of being a common possession of multitudes. And when it has been shared by all, each possessor has still the full enjoyment. When, therefore, we find an emotion arising in the knowledge of an object affording delight in itself, and whose only purpose is delight, from which the loathsome and the fear-producing flee away, and which we feel to be free as the air of heaven to be breathed by all who will, we may recognise the truly æsthetic. In play, the activity is æsthetic; in work, it is the contrary.

§ 49. It appears, then, that anything which fulfils these three conditions may be an object to excite æsthetic emotions. The sensitivities through which æsthetic feelings are aroused are chiefly, but not wholly, the eye and the ear. Of course, representations of experiences and intellectual constructions, develop, increase, and modify the emotional manifestations which are called æsthetic. And the great emotions, as love and anger, with many of those which are less powerful and controlling as well, may become æsthetic, and are æsthetic the farther they are removed from disagreeable associations and selfish absorptions.

§ 50. The emotions æsthetic are described under such names as Beauty, Sublimity, Grandeur, Harmony, Grace, Melody, Delicacy, Ideality, Picturesqueness, Proportion, Order, Fitness, Keeping, Congruity. It may also be added that any effect tending toward the æsthetic conditions gives an æsthetic impression, and its name gives a suggestion of æsthetic emotion in greater or less degree of fulness. Neatness as a condition is always suggestive of the æsthetic, though its maintenance may be a pure matter of utility. And as the condition is contemplated apart from considerations of utility, it may become actually æsthetic. Sometimes a distant mountain side is faintly coloured by rainbow tints which throw a delicate light upon the dark surface before the full glory of the bow appears, or after it has departed, and its traces linger to delight us. So do æsthetic emotions often colour and beautify even the commonest and least beautiful objects, and elevate the prosiest and least agreeable feelings. The above names indicate varieties of æsthetic emotions which overlap each other, but do not usually cover exactly the same ground. Melody had reference originally to the ear; Delicacy probably to the inferior senses (*deliciæ*); Harmony both to the eye and ear, while the others most likely had primary regard to the sensations of sight. The import of these various names will receive elucidation as we proceed.

§ 51. *Beauty.*—The emotion experienced in the apprehension of beauty is the generic æsthetic emotion arising in connection, primarily, with objects of sight, but thence extended so as to arise in connection with any æsthetic object, however presented. Probably the earliest experiences we have of the beautiful (that is, of the emotion excited by whatever we choose to call beautiful, as inspiring that emotion) are those of light, colour, and lustre. The eyes of infants are caught by brilliancy of colour at a very

early period of their existence. That there is such a pleasing effect from colour is evident, but it does not seem possible to explain how it arises without going back and tracing the history of the whole race. Light is probably agreeable because it is so intimately connected with vitality. White colour is attractive as the colour of light; black is disagreeable as connected with the reverse of light. Green is pleasing because of many pleasant associations attached to the recurring green of spring time; blue, because of suggestions of the blue of the heavens in clear weather. The emotion of the beautiful also is stimulated by visible form. Outlines, contours, attract and have a tendency to excite æsthetic emotion. The breast becomes an object of beauty to the infant, and its form impresses itself upon the child's mind as a form of beauty, the æsthetic emotion springing out of the agreeable emotion excited by the sight of it in reference to supplying his animal wants. The æsthetic pleasures of form take their rise ultimately from muscular associations, but mediately through the sensation of sight. If we had not that sense, we could, it has been seen, obtain a perfect knowledge of form and magnitude, and so, undoubtedly, could have æsthetic emotions therewith, but their scope could not be so great as where they are experienced with the aid of sight. The absence of the effect of colour alone would work the result of diminishing the extent and the intensity of the pleasure.

The primary æsthetic effects, as inspiring emotions of the beautiful which arise from the sense of hearing, are perhaps those that spring from the soothing of an infant to sleep. It may be the mother's lullaby, the regular succession of sound of a rocking cradle or chair, or the regular tapping of the foot on the floor as the mother stills the child. These furnish a foundation for æsthetic emotion, supposing always a constitutional adaptation therefor.

§ 52. The intellectual processes, securing a variety of associations, are necessary in order to develop emotions of the beautiful to any considerable degree. The more highly representative the cognitions, the more complex the associations, the more refined and the more æsthetic the emotions become. The suggestion to the mind of dancing, riding, walking, irrespective of any intent to perform the act one's self, or any recollection of having performed it, awakens an æsthetic interest. It need not be added that such a suggestion is re-representative. The

emotion exists in the contemplation of the object as apart from mere individual selfish interest, and free from anything disagreeable connected therewith, any labour or pain. So with all the grosser sensibilities; they exist in the ideal, refined and clarified and full of æsthetic interest. They may become so idealised as scarcely to suggest the original and lower enjoyment with any view of gratifying the same. The earthy may be put down, and the spiritual raised up to delightful and engrossing contemplation. A picture of a feast is delightful for its artistic effects, not because it arouses to gratification the activities for stimulating the palate. The statue of a beautiful woman undraped delights us with the beauty of outline and proportion, not because it awakens any sensual passion, though the associations of a gratification of that passion are suggested. The acting of a tragedy stirs us with emotions of approval and pleasure at the faithfulness of the representation and with some sympathetic effect, but does not urge us to gratify our predatory feelings by the commission of crime. The description of a battle may absorb our attention with its skilful delineations, and yet not drive us to war. Intellectual artistic associations are helped largely by experiences presented or represented, of unity in variety. This is seen in music, where the like in the midst of the unlike gives so large an increase of pleasure. Time, with its alternations of tones, varieties, and uniformities of accent; pitch, with definite and various intervals of the scale, harmonies, and discords; all, by their variety in unity, increase the extent and degree of æsthetic pleasures. In speech, rhetorical cadences and inflections have a similar effect. Very notably, too, we observe the force of this principle with objects of sight. The landscape, with its infinite varieties and yet its agreements and uniformities, realises the case. We experience delight in the arrangement of objects so as to bring out a sameness with difference in the particulars, as when we lay out a garden, or arrange books in a case, putting those of a size together. Right lined figures, as squares and parallelograms, give us more satisfaction than scalene triangles. Angles which are aliquot parts of a right angle are preferred to those more irregular. Figures on the carpet or the wall-paper must conform to the same law in order to be æsthetically agreeable. The countless associations connected with every object open a limitless field for æsthetic effects. Some of the associations of colour have been cited already. Among those of form and outline are the ease

suggested by curved lines and the discomfort by straight rigid lines, unless the idea of support be involved, when rigidity is a necessary and agreeable element. There may be noticed also the pleasure experienced from that which betokens strength and solidity in buildings, bridges, columns, and walls. And yet in all these cases, unless there be an economy of material and labour evident, the *tout ensemble* is not charming. The obelisk and the column are more fascinating as objects of beauty than is the pyramid. Furthermore, fitness or adaptation to an end always gratifies; and the greater the appearance of mighty effects being wrought with ease, the more hold the æsthetic emotion possesses. Smooth running machinery, sharp and clean-cutting tools, the adaptations of nature, the power of the lightning, the operation of electricity in the telegraph, produce æsthetic effects of no inconsiderable magnitude. The sailing of a ship under a strong breeze makes a powerful æsthetic impression upon us. All the associations of human activities multiply the sources of æsthetic emotions. The human form, the face, the powers of mind, the products of human genius, the institutions of human society, the ultimate destiny of mankind, furnish endless and ever-varied points of attachment for this class of feelings.

§ 53. The emotions which are more generally noticeable as æsthetic are tender emotions, anger and power. The first of these is pre-eminently capable of becoming æsthetic. Those forms of the irascible emotions which arise in connection with the achievement of victory, are decidedly æsthetic. But so also may be hatred and cruelty. Anything involving power, superiority, or supremacy, whatever suggests liberty, whatever has the effect of novelty, whatever refers to approbation, praise, admiration, and esteem, gives room for the emotions of beauty.

Enough has been said to reveal the vast complexity of the emotions of beauty, the infinite variety of their objects, and the fine and numerous divisions of their scale of degrees. Whatever the objects may be, however, they must conform to the three conditions of æsthetic emotion; and in the proportion that they do conform, they create a greater fulness and perfection of that kind of emotion.

§ 54. *Sublimity.*—The emotions of the sublime are varieties of the emotions of the beautiful, in which there is a preponderance of the emotion called up by power. The term grandeur has substantially the same meaning. The feeling is not so much one

of possessing power, as of witnessing power in that which is outside of ourself and in entering into it sympathetically. In that way we come to have somewhat the same pleasure as if we really had it ourselves. The consciousness of human power is very likely the starting-point of the emotions of the sublime; and probably first the spectacle of physical power was the prime awakener; then moral power of various sorts to command admiration continued and enlarged the emotions. Where power is exerted benevolently the effect of the sublime is most certain, though the same effect is witnessed in regard to malevolent exhibitions of power, provided the spectator is himself removed from great danger and fear. Destructive power manifested creates a feeling of awe in which sublimity obtains, with an infusion of fear, likely to become ascendant. Perhaps generally there is an element of fear in the emotions of the sublime. Among inanimate objects, such phenomena as the noise of a torrent, the crash of thunder, the beating of breakers, the explosion of gunpowder, the eruption of a volcano, the fall of masses of rock, are productive of the like effects. The feelings of melancholy are also frequently involved with the sublime; the sound of the curfew, the tolling of a heavy bell, the deep notes of the organ, are instances of occasions. In the sublimity of space, vastness, expanse, is an additional element, though associated closely with the idea of power. Voluminous sounds, an extended prospect, alike awaken the feelings of sublimity. Extent of time as filled with multitudes of events, and covering the growth and disappearance of many generations, is sublime, filling the mind with ideas of vastness, power, and melancholy, or joyous pride. In like manner, the effect of the sublime is wrought by literature of various kinds, through the associations which the words recall.

§ 55. *Harmony.*—The effect of harmony is one of diversity in unity, or unity in diversity; that is to say, it creates a pleasure from the recognition of likeness in the midst of the unlike. Of course, not all agreements in the midst of difference are pleasurable; but the effect of such conjunctions lays the foundations for an æsthetic emotion when the general conditions of such an emotion are present. We mean by harmony, then, as referred to mental states, an æsthetic emotion arising in connection with objects wherein there is agreement in difference. Harmonies exist in objects of sight, as in the colours of the landscape or of a skilfully painted picture, and in objects of hearing, as the concords

of instrumental music, the rhythms of pronunciation and song, and in the music of the air, embracing all the harmonies of sounds which nature produces.

§ 56. *Melody.*—This is an æsthetic effect of succession of agreeable sounds. Harmony involves co-existence; melody, simple succession. Melody is connected with difference in pitch and quantity of sounds. Melody and harmony both occur as elements of the delights of music.

§ 57. *Grace.*—Grace is the beauty of movement. A graceful person is one whose form or face expresses or indicates capabilities for agreeable movements. A clumsy person is not graceful; a homely face does not discover grace; but one suggesting an agreeable play of features is graceful. Dancing affords fine opportunities for the display of grace; so also does oratory, with its gestures and facial expression. Wrestling among the ancients had similar attraction. The flight of a bird is graceful; the sweep of the eye over a curved line brings out the emotion of gracefulness of the line. Probably our predication of gracefulness in speaking of a column has reference chiefly to the impression of movement made by the muscular effort of the eye in taking it in. Strictly speaking, however, the use of the adjective graceful is proper only to that which is very directly connected with motion.

§ 58. *Proportion.*—This is a harmony of the whole with any of its parts. An edifice is beautiful in its proportions when its height or length is in harmony with the whole. The proportions of the human figure are beautiful for a similar cause. The influence of proportion as producing emotions of the beautiful is observable in all objects of sight, although in architecture its effect is most prominent. Closely allied with this is the effect of symmetry, which concerns itself more especially with the harmony of parts with each other. The two legs of a statue are symmetrical when they are harmonious with each other; the statue is of good proportions when the limbs are in harmony with the whole.

§ 59. *Order.*—Regularity, precision, system, order, are all productive of æsthetic emotions. The term order has reference to the regulation of things for useful ends. Whatever is well arranged, well systematised, is in its best condition for usefulness. There are no unpleasant interruptions; every thing is fitted to its purpose, all things are in their places, and the disagreeable effects of toil and unproductive labour are eliminated. The impression of unity in diversity and harmonious adjustment is generated. Order

gives room for rendering æsthetic the operations of common industrial life.

§ 60. *Fitness, Keeping, Congruity.*—These terms all indicate harmonies. They are of wide scope, and may concern the relations of the parts of a drawing, of a piece of patchwork, or the relations of men in society, with all the varieties of time, place, and other circumstances. Or again, they may have reference to the compositions of literature or the exercise of oratorical talent. A man's mode of life befits his circumstances, his deed is in keeping with his character, or with the occasion, the necessities of the hour. A sentence, a phrase, a verse, is said to be in keeping with the subject, befitting the style, or in congruity with experience or nature. The æsthetics of social life, involving social proprieties and conventionalities, have much to do with fitness and keeping. The associations in which these effects exist, or with which they are involved, are countless as the sands of the sea; and the complexity of the ideas and emotions is probably beyond all resolution.

§ 61. *Picturesqueness.*—Under this name we have disclosed the emotion to which the mind gives birth upon observing a landscape, with the associations of its suitability for pictorial representation attached. Not merely the natural beauty of the scene enters into the ideas and feelings, but also, as connected therewith, the artistic beauties of a picture. We consider it a beautiful landscape, and as of the kind to make a beautiful representation upon canvas or paper. There is a mutual interaction of the beauties of nature and art.

§ 62. *Beauty of Character.*—A great number of appellations are used to indicate beauty of character. The vocabulary of terms of praise, flattery, and adulation indicates multitudes of words having various shades of significance, but all looking to the æsthetic of character. The words ideality and spirituality, for instance, indicate an æsthetic elevation. The various virtues generally attach similar refinements of emotion to them. The glamour thrown about great heroes is of an æsthetic nature. In connection with beauty of character, love is of most powerful and transcendent influence. It enters into and sometimes is the foundation of all the æsthetic interest which attaches to personality.

§ 63. *The Comic and Ludicrous.*—The phenomena of laughter have much that is æsthetic involved in their manifestations. Animal spirits, the outburst of liberty, tender emotion—if not too intense—self-complacency, victory and power, all may give rise

to laughter; so also many physical causes, as tickling and hysteria. There are some associations that make an effect of ludicrousness with which is coupled an emotion tending to excite laughter; and these associations may arise in very many ways. It is important to discover the common element. It may be considered that the fall or degradation of some person or thing having associations of dignity, in circumstances which will not call forth any other strong emotion, as anger, fear, or sympathy, is the common occasion for an apprehension of the comical and ludicrous. The effect of great dignity upon a person witnessing is to cause a restraint which, if not accustomed, is painful. An enforced solemnity is created which is often intolerable. So equally the pride or self-approbation of the spectator is wounded; an emotion of rivalry, envy, and jealousy is apt to spring up. If then suddenly (and I apprehend the suddenness is essential) anything occurs which has the effect to lower, degrade, or overthrow the importance beheld, there is a prompt release from restraint, and a feeling of exultation in which one's own self-estimation is increased and gratified. In these feelings and associations rests our perception of the ludicrous. This effect is vastly heightened if we know there is no foundation for the assumed dignity or importance which received humiliation. Yet sometimes the 'taking down' of a person of genuine worth has much comicality about it. But in all cases it is important that there be nothing present to excite loathing, disgust, displeasure, fear, anger, or even great sympathy. Herein we observe the æsthetic character of the mirthful emotions. Their connection with the play-impulse is another phase. The joyousness of sport is perpetually detecting and lighting upon incongruities that are comic and laughable. Inasmuch, however, as all incongruities are not ludicrous, analysis will generally discover that the fact of degradation is bound up in all such comical effects.

(II.) AVERSIONS TO EXTERNAL OBJECTS.

§ 64. Standing in direct opposition to all the sympathetic emotions are those whose type is aversion and antipathy, the culmination of which in one direction is anger, and in another fear. An aversion to an individual or thing, preventing the going out of sympathetic influences, seems to proceed from two distinct sources; an impression that there is some deleterious or ruinous effect to

come from what appears, and a destructive impulse. The former of these sources is that of fear, the latter that of anger. The synthesis of the two classes of emotions thence proceeding is in their common antagonism to sympathy. Anger passes into fear, and fear into anger, but each has its own peculiar manifestations which will now separately be examined. In anger we repel the object of aversion; in fear, we flee away from it.

ANGER.

§ 65. A state wherein animals live by the destruction of each other gives rise to the substantial characteristics of emotion which are indicated by the word *anger*. The groundwork of the emotion is a pain coming from the resistance made by prey, and arises in pursuing, attacking, and killing another animal. Thus reacting against the pain come pleasurable accompaniments in the way of emotions of pursuit, introsusception, the joy of victory and escape from destruction, which would have ensued in the event of failure. Hence pain and pleasure are commingled in anger. The many variations and refinements of these feelings are readily explicable from the varied and changed circumstances of successive individuals, generations and races. In the human race, the collisions and antagonisms of men give occasion for frequent rousings of activity to repel attack; but the activity does not find its full satisfaction in defence. There is a positive inclination to inflict pain in return, a proneness oftentimes to find excuse for creating misery, and a clearly marked delight in the pain of others. This delight is inherited, but it is repressed by the cultivation of the sympathetic emotions; when, however, the individual is attacked, the exertion necessary for defence gives opportunity for, and justifies, the pleasure of inflicting pain. With the increase of civilisation attack is less frequently physical and less directly aimed at life. Antagonism in any form, then, as of opinion, ambition, or love, generates in a degree the same feelings as when life is menaced, and thus anger is exhibited in connection with all the social relations; there are seen the same putting forth of activity to repel and defend, the same aggressiveness, and the same satisfaction in the discomfort or discomfiture of others. Were we not able to enter into the pains and pleasures of another, to understand them and to read them, the most refined and exquisite forms of anger would be impossible; hence sympathy as a trait some-

times subserves the purpose of increasing indirectly the various delights of anger, though the two are fundamentally opposed.

§ 66. In the genesis of anger on special occasions, there first occurs a painful feeling. This is followed by an effort to throw off the pain. The fact that the pain comes from a person, suggests the idea of that person being susceptible to pain, and prompts to a counter-infliction as a means of teaching the offender not to repeat his injury. There is also existent the natural enjoyment in witnessing the suffering of another, to the origin of which reference has been made. If the circumstances demand it, the whole force of body and mind may be directed to the ends in view; and success and victory create an exultation which compensates for the original pain.

The pang which leads to the excitement of anger must not be so intense as to paralyse the active powers. A blow may be so heavy as to crush out anger and create only terror or grief. Anything that irritates or stings is the most favourable for producing irascibility. Anger which is developed by premeditated injury is much deeper and much less easily satisfied than that which opposes itself to unintended affront. In the former case, our pride and self-regarding feelings generally are wounded, and the wrath is more rankling. The humiliation of the offender is required, and in that humiliation alone can the satisfaction of anger be effected.

§ 67. In observing the bodily sufferings of people there is a sensuous pleasure that has always been marked sufficiently in human history. The view of writhings, contortions, death, especially from violent means, has sometimes a very great attraction. The highest civilisation has not yet been able wholly to eradicate it; it is as natural as are the pleasures of love, and sufficiently explicable on the theory of the predatory nature of man.

§ 68. The physical manifestations of anger lie in excitement of the vascular system, and urgency to activity of the moving organs. Where excitement readily occurs, irascibility is apt to be correspondingly a prominent trait. In addition to general excitement of the system, anger displays itself in the initiatives to destructive activity. Young children, when angry, roll on the ground, kick, bite and scratch.

Where the emotions are more restrained, there still is found a tension of the muscular system and impulse to strike, a clenching of the fists, a scowl or frown on the countenance, a firm closing of the teeth, glaring of the eyes, retraction of the lips, and a dilation

of the nostrils. Similar exhibitions occur in the lower animals. When anger has spent itself and success is obtained, often laughter or a triumphant grin supervenes as the activity abates. In a state of anger, the voice is harsh, strident and discordant.

§ 69. *Sudden Wrath.*—It has been remarked already that some temperaments are liable to sudden influx and efflux of emotion. In such persons anger is readily aroused, and usually subsides as readily. The outbursts are, however, in many instances terrible. They occur in minds ill-balanced, where there is little breadth of thought and no power of restraint. A single circumstance will raise a passion oftentimes wherein a torrent of angry feelings bursts forth, and for a time carries all before it. In this form we have the most marked and characteristic exhibitions of anger. It is common among animals and in the lowest specimens of humanity. It is more common also in childhood, before a volitional control has been obtained over the feelings.

§ 70. *Revenge.*—Deliberate or slow development is the form of anger seen when the mind has become more highly cultivated and its emotions more thoroughly restrained. It is manifested under many varieties. One very common exhibition is of revenge. In this case the irascible feelings are nourished and kept alive till opportunity is afforded for a full retaliation, and in the consummation of this retaliation, often in the refinement of it, great satisfaction is obtained. 'Revenge is sweet.' Sometimes it vents itself in a single act, and often in a long course of hostile conduct. It has led to wars of the greatest bitterness and ferocity, springing from the anger of potentates cherished long and relentlessly. Achilles' implacable wrath was 'to Greece the direful spring of woes unnumbered.' The luxury of revenge is sometimes so great that it is delightful to prolong the duration even of the offence for the sake of the retaliation.

§ 71. *Cruelty.*—Independently of pain inflicted on us by any creature, there is always the refinement of anger before alluded to, which draws its joy from putting others to pain. The pleasure of torturing another is very exquisite. We observe its existence in the putting of human beings to physical torment, as in the days of the Inquisition; in the infliction of pain upon animals, as seen in the cruelty of boys towards cats and dogs; and among the more civilised and refined in annoying and harassing the feelings of others. 'Hazing' and 'nagging' are two expressive terms used to describe this sort of amusement; school teachers,

elder boys in school, police officers, and others in positions of authority; women, also, toward their lovers and husbands, show a sublimated cruelty, which is grounded in the same sources whence proceed more brutal torments.

§ 72. *Hatred.* The term hatred refers to a permanent feeling of antipathy which may or may not be tinctured with revenge, and which is strong enough to exhibit itself in clearly marked evidences. A natural irascibility joined with great unlikeness, and an occasion of opposition, will develop hatred between two persons.

Rivalry, the exercise of authority, great inequalities of condition, party spirit, difference of race, of government, or of religion, may be enumerated as causes of hatred.

§ 73. *Hostility.*—The state in which the mind finds itself ready to go out in action against a displeasing object is a state of hostility. It may exist without hatred, or it may be concomitant with hatred. It occurs in the case of involuntary offence, unpremeditated and accidental; in a higher degree, where the offence is the result of carelessness, still more where a person without intending harm to any one pursues his way selfishly and inconsiderately, regardless of the rights and interests of others; and perhaps in the highest degree where the affront or injury is premeditated and deliberate.

§ 74. *Warfare.*—When hostility acting itself out meets with resistance, a state of warfare ensues. In bodily combat we have the most terrible forms. All the energy is aroused, and the muscular and nervous systems are keyed up to their highest pitch of intensity. In this case, anger expends itself and abates only upon putting the opponent *hors du combat.* It is not always satisfied then. If the spirit of revenge be present its gratification may require even the mangling of the body of the dead. From physical combat down to simple dispute there are many grades and varieties of warfare. Debates, plots to undermine, or to take advantage of circumstances to work out another's damage, law suits, competitions in business, all indicate forms of warfare. Sometimes the irascible motion is subdued, disguised, and converted into softer and sweeter sentiments, as in the case of outdoing another in good work; but the spirit of rivalry, wherever it exists, is an offshoot of anger.

§ 75. *Righteous Indignation.*—A feeling of wrath is often attended with the conviction that the person against whom the anger arises has offended against the laws of God and man, and is

a disturber of the peace of society. This conviction may indeed be at the root of the feeling. Where such anger exists, it is generally approved as just and worthy. It is a modification of the general emotion which comes from the superadded feelings connected with the maintenance of the social state. A man has offended, and the security and welfare of all men demand that he should be made to feel the force of men's displeasure. It is a similar feeling which convinces of the justice of punishment and prompts to its infliction. Sometimes punishment is consciously remedial, having in view the good of the offender; oftener, however, it is inflicted from a sentiment growing out of thoughts and feelings just described as comprehended under righteous indignation. Mere resentment and retaliation are not punishment. An idea of an infringement upon the liberty and rights of others and of necessity for those rights to be made secure and to be vindicated must arise before the emotions prompting toward punishment are complete. We here enter upon the ground of ethical emotions.

§ 76. *Envy and Jealousy.*—These are two forms of emotion which contain a prominent irascible element. In the latter of the two fear is also an important constituent; tender emotion also occurs. In envy the egoistic feelings of self-approbation come into play; and also pain and dissatisfaction with one's present condition by comparison with the prosperous condition of another which we consider ought to belong to us. Of the two the latter is the more acute and violent emotion; the former is more constant and even in its manifestations. The term *gnawing* is often used to describe envy. Its action upon happiness is corrosive.

FEAR.

§ 77. The emotions characterised by the term fear are those which attend the apprehension of future evil. As anger is an extraordinary elation of the energies springing from predatory habits, and love is an arousing of the vital powers tending toward the propagation of the species, so fear is a depression of all the powers except those of aiding in escape with a view to the preservation of the individual from apprehended danger. Anger and love are characteristically pleasurable; fear is painful. Care must always be taken not to confound fear with pain in general; the pain of a hurt is one thing, the fear of that pain is another.

The pain of fear is a massive one, overpowering the mind and lowering the energies. Where there exists an opportunity for escape, there is a direction of energy to avail one's self of that opening. But where there is uncertainty, and no sure way out of danger presented, there is an abatement of all activity. In the prevalence of fear, there is a general intellectual excitement directed toward those associations intimately connected with the objects of alarm. These associations, through the concentration of the mind upon them, are impressed strongly upon the memory. The presence of surroundings causing terror seems to paralyse the mental activities. A man's intellect is not able to release itself from the thraldom of the objects of terror. They occupy the mind as fixed ideas, which are sufficiently persistent and powerful to control the will.

§ 78. Fear is a highly representative emotion, dependent not merely on a knowledge or experience of any real pain, but also upon the general physical and mental condition at the time fear is excited. Accordingly, it may be seen that belief modifies the emotions of fear. There is a close connection between the two. If we believe an event fraught with peril is to occur, we are fearful; if our belief is less strong, our fears are less strong. So also a state of ignorance, uncertainty, or darkness increases fear. If we know exactly what is to happen, we may be able to measure accurately the impending pain, and consequently have only a shrinking proportioned to the magnitude of the evil. But when danger unknown in amount is apprehended, the vagueness, and consequent perplexity and distraction, give the highest and strongest experiences of fear. The mere infliction of pain may be an exciting cause of fear by weakening the nervous energies and by suggesting the possibility of greater evils to come.

§ 79. The physical effects and manifestations of terror are a general demoralisation of the bodily functions. The circulation is interfered with, the heart sometimes beating intermittently and usually with more rapidity; the stomach digestion is stopped; the peristaltic motion of the intestines is increased; the muscles are relaxed; the limbs tremble; the voice is paralysed if the terror is intense enough, otherwise there is an inclination to cry out; the eyes are anxiously directed hither and thither, or fastened in a fixed gaze upon the object causing the fear; the countenance is distorted, and there is a general shrinking away of the whole body as if to flee from the presence of evil.

§ 80. *Servile Fear.*—The cringing of a slave before his master is the expression of a common form of fear. His condition teaches him his liability to punishment, and experiences of severity or of caprice in its infliction are stimulating causes of terror. A servant who has been flogged unmercifully has his fears awakened by any symptom of his master's resentment; and he who has frequently suffered without special cause beyond the humours of his employer, lives in a state of constant dread. This latter case is exemplified under a despotic government. Both cases are often seen illustrated in the family. The same effect of uncertainty is found where there exists great complication. To an ignorant man the complexity of law causes as much fear of a law-suit as if it were to be decided according to simple caprice.

§ 81. *Anxiety.*—This is an uneasy state wherein fear has not reached the full development of controlling the mind, but is yet present sufficiently to cause some perturbations. Where there is a constitutional predisposition to such states of mind, we have forebodings, 'looking on the dark side,' and proneness to anticipate disaster, injury, and evil of all sorts.

§ 82. *Suspicion.*—In the form of fear characterised as suspicion, there is a readiness to view unfavourably and to take apprehension from things and persons that in an ordinary state would occasion no alarm. Any general terror or anxiety is apt to produce suspicions. These lead to more pronounced forms of terror, or awaken anger and efforts to remove or destroy the cause of distrust. There are characters in which the readiness to suspect others is a predominant trait. Such persons do not themselves command confidence and respect.

§ 83. *Panic.*—Where a frenzy of fear seizes a crowd or a multitude, a state of panic ensues. This is exceedingly infectious, and, once started, spreads with great rapidity and produces the most utter helplessness and the wildest abandonment to the influence of terror. All self-control is lost, and perhaps scores are injured where there is not the slightest necessity for any one to be hurt.

§ 84. *Superstition.*—This habit of mind has considerable relation to fear. In superstitious people there is a large element of emotion of terror in different respects. This, naturally enough, arises from ignorance of the real character of the phenomena which excite fear. They invest the natural forces around them with terrible and awe-inspiring attributes. They are prone to

believe in diabolical agencies; they are easily led to fancy that ghosts, fairies, spirits, infest air and earth. Trust in omens and oracles grows out of such a disposition. Propitiatory rites, sacrifices, and many of the ceremonies of worship have their rise in feelings of fear of some power greater than nature, but of which they know not definitely the character or the extent for good or ill.

§ 85. *Diffidence.*—Bashfulness, shyness, want of confidence in society, all proceed from emotional states which have fear as a ground-work. This fear may be apprehension of having one's sensitiveness hurt by the want of deference shown by others, or that we may by some act or omission of ours lose or fail to win the good opinion of society, or that we are ourselves, in reality, unworthy to come into association of those we meet, either through lack of intellectual acquirements and general culture, or through inability to display to advantage what we have. The fear itself is a source of exquisite pain, and paralyses often all the powers which we actually possess, making us to seem precisely as we feared we should seem. These emotions must exist concurrently with a desire for the good opinion of others.

§ 86. *Fear of Death.*—Dread of death, the 'king of terrors,' does not always proceed from the same sources. This fear may be of the physical pain attendant upon dissolution, which is created and heightened by many unpleasant associations, but which is largely imaginary. It may also be unwillingness to have one's plan interrupted, one's purposes checked in their fulfilment, one's hopes defeated.

Or, it may be a terror coming from expectation of damnation and torment after death. Where there is a fulness of life and vigour the idea of death is terrible; but when the body is wasted by sickness and the energies are consumed, death may be longed for and expected with that delight the wearied looks forward to in sweet and gentle slumber which brings rest and peace.

§ 87. The opposites of states of mind under the influence of terror are those in which subsist coolness, composure, knowledge of all one's surroundings, trust, confidence, security, and balance of thought and feeling. The best antidote of fear is knowledge.

Fear is not always depressing at the instant of its approach. Sometimes it acts as a stimulus, and its beginnings rouse a spirit of energy, competent to throw off all further attacks of the enemy.

ANTIPATHIES AND AVERSIONS GENERALLY.

§ 88. In most of our dislikes fear is a conspicuous or latent element. Anything that portends pain for ourselves and for others may become an object of antipathy and aversion. The conflict of individual with race-development of course makes some things pleasurable to us which are painful to others. As altruistic feelings grow, altruistic antipathies are generated more freely. With the increase of representative development our feelings of aversion extend to remote objects, covering the whole field of experience.

§ 89. Antipathetic manifestations from others arouse in us anger, or fear, or both, in all their varieties according to circumstances. Where these manifestations are limited to simple withdrawal of sympathy and love, sorrow and apprehension often ensue. Where disapprobation is more positively exhibited, as in censure and condemnation, a very painful emotion is generated. Disapproval is most painful when coming from those we respect or upon whom we are in any way dependent. Shame arises in this connection. This may be caused by the consciousness that disapproval is felt by others even where it is not expressed. We experience a self-humiliation, a disturbance of self-complacency as well as fear of ills coming from the withdrawal of the favour of others. The manifestation of shame and the reception of censure occur in what is termed 'falling of the countenance,' in a shrinking of the body when fear is prominent, and in a general uneasiness of the body. Sometimes we have an aversion to the person who inflicts the censure, and sometimes a self-aversion or self-abhorrence is felt, the nature of which will be more apparent when we come to consider ethical emotions. When exhibitions of disapprobation provoke anger, we display retaliation. This we often do by depreciating the person from whom the disapprobation comes, by justifying our own course or our worth, and by 'answering back.' On the other hand, when the prominent emotion is that of fear we endeavour to remove the cause of censure in us or ourselves altogether from the range of censure. If we cannot or will not correct, we attempt to get out of the way.

§ 90. The general course of expression of antipathy and aversion is about the same in the lower animals as in man. Where a creature in feeling pain strikes back, anger is not necessarily involved. Anger implies some degree of representation. The pain

arouses anger if there is any cognitive appreciation of the object which causes the pain. Anger is a complex centrally-augmented feeling which is developed from the representation of painful experiences replaced by pleasurable through the putting forth of energy to repel, and which is stimulated by present pain calling up these associations and rousing the former feelings. That fear or apprehension postulates representation and depends upon it is perfectly obvious.

ETHICAL EMOTIONS.

§ 91. The emotions which are termed ethical arise from the social condition of man. They are, like the æsthetic emotions, exceedingly complex, and most perfect in a highly re-representative mind, where the balance between emotion and cognition is properly preserved. They may be comprehended, in the main, under the following description:—Ethical emotions are those arising in connection with approval or disapproval of a man's acts, or states of consciousness, considered with reference to their bearings upon the interests or pleasure of other sentient beings and their reflex consequences upon self. There is a very intimate association here with the volitional. Approbation implies volition, and it is quite impossible to separate in fact ethical emotion from ethical volition; but a presentment of the emotional side may be made separate from the volitional, sufficiently to make the emotion the prominent subject of observation. It must never be forgotten, however, that the two are only two sides of the same phenomenon, of which ethical cognition is the third side, and that the three are just as intimately connected as are the two first named. The difference between an ethical emotion of approbation and a simple approval would seem to be this: the latter is made with reference to self primarily; the former with reference to others primarily. If a person makes me a gift, I approve of his act in the first instance because it affects me and my interest agreeably, irrespective of other people. If that person makes a gift to a third who is worthy, I approve the act because it is agreeable to the interests of a third person, and it is indirectly for my interest that the welfare of others be promoted. So, if a man strikes me in the face, my disapproval and indignation are aroused because my own pleasure and safety are directly compromised: if I see one striking another than myself, I disapprove because the safety of that other

is compromised and my own remotely endangered. In both these classes of cases, the latter emotions engendered are ethical. This description of ethical emotions at once reveals clearly their complexity; for the sources of moral approval and disapproval would be as numberless as the objects which affect human interest and pleasure: nevertheless, these emotions can be grouped together and aggregates of them discerned as forming tolerably distinguishable masses of feeling.

§ 92. Ethical emotions may be divided into two general classes; *first,* those ethical emotions excited with reference to other people's acts and states of consciousness, and, *secondly,* those excited with reference to one's own. Under the first class are included such emotions as love of beneficence and hatred of maleficence; love of fortitude and hatred of pusillanimity; love of prudence and hatred of improvidence; love of truth and hatred of untruth; love of justice and hatred of injustice; love of right and hatred of wrong; love of virtue and hatred of vice. Under the second class are included such emotions as those of duty, conscience, and remorse.

§ 93. Ethical emotions of the first class are inspired, in great part, by our view of what is useful for sentient beings. Those things which we have learned to consider of general utility we approve, those which we have come to believe of non-utility or of hurtfulness we condemn. It is not true, however, that this explains the whole matter. Many of the things upon which we visit moral approbation or disapprobation are things about whose consequences we never have reasoned at all. A child is taught to avoid a thing as wrong, and does dislike it as wrong a long time before he has any distinct idea of its non-utility. Moreover, many things have been held as ethically wrong which actually are useful or have no connection with utility at all. The eating of pork is held by the Jews to be ethically wrong, and while once, perhaps, the abstinence from this article of food was useful to the common weal among the Jews, ethical disapprobation of the practice of eating it has gone far beyond necessity or utility. There is then a foundation for ethical approbation and its contrary in sentiment as well as in utility. This sentiment has its origin in organisations and growth of experiences of utility and non-utility, in the arbitrary will of potentates, priests, or prophets, in arbitrary social prejudices, likings, or tastes, around the observance of which have clustered agreeable associations, and about the non-observance

of which have, in like manner, been associated things disagreeable. There are many social approbations and disapprobations which are not considered ethical, as the word is generally used. The requirements of fashion give us ready illustration. It may be considered, however, that the only difference between these and what are ordinarily considered moral obligations is in the relative permanence or transiency, universality or limitation, utility or non-utility, going together to make up the relative importance of the two in consequences or results. It is often a work that passes our ability to explain the origin and causes of our moral approbations and disapprobations, and to explain why this should be regarded of greater moral consequence than the other. The explanation of the superior importance of the distinctively ethical emotions will be found in the fact that in our ethical emotions we have present more or less the idea of the consequences which will befall an offender, and of the power which enforces moral rules. In proportion, then, to the importance of those consequences, and the effectiveness of the supervising power, the emotions are stronger and more deeply coloured by impressions of awe and solemnity.

It should be remarked, with reference to this class of emotions, that they exist in pairs. Approbation of one class of acts always implies disapprobation of the opposite. One can not have approval of a virtuous act without having a disapproval of a corresponding vicious act. The principle of relativity obtains here as completely as elsewhere in our mental constitution. Hence ethical interests include some aversions also, which we will consider together with the pleasurable interests in so far as they have ethical character. The terms love of virtue, hatred of vice, and so forth, are not altogether satisfactory, but yet seem to be the most suitable of any to express the emotions. Our love of a virtuous deed is very different from our love of a person; yet in the approval which is consciously bestowed upon virtue there is oftentimes a clearly evident element of tender emotion. The hatred toward an evil practice which we cherish is not the same as the hatred we have of a person, yet both spring from the same sources. The terms employed are indistinct in not designating clearly or defining accurately the objects which they mark, their relation of time, or their other incidents; but the difficulty is inherent in the objects, which are themselves so indeterminate and inconstant that no language, however rich, could accurately mark them.

§ 94. The chief constituents of ethical emotions of the second

class are the same which are found to be in those of the first class, with important modifications coming from the presence of a larger amount of self-regarding emotions. I view the doing of an act by me in the light of my feeling of the effect upon the interests and pleasure of others, and the consequences to me as coming from the way in which my act is regarded by others; and the most poignant stimulus present is the hope of reward or the fear of punishment. The latter seems to be earlier and stronger than the hope of reward. Personal love for the one whose good or bad opinion is to be expected, and from whom most of the resultant consequences for good or ill are to be apprehended, has the tendency to increase the ethical emotion. The displeasure of one whom we love, or of one upon whom we are dependent, is more to be dreaded. As we have received more good from such than from others, so the withdrawal of that good is more dreadful to contemplate and experience. It is very doubtful if we could have any such emotions as we term moral, were it not for the existence of punishment. Even in estimating the acts of others our moral disapprobation involves the feeling that the persons perpetrating such acts are worthy of punishment; and our own view of personal duty and obligation involves the fear and avoidance of punishment. The hope of reward, and the avoidance of punishment, often mingle in securing our approbation of some proposed deed of ours, but the latter is quite sufficient to secure that approval. Influences like these create moral sentiments which are perpetuated from generation to generation, receiving modifications from the varying circumstances of individuals, creating new utilities and demanding new adaptations; but there exists always in each individual a body of instructive moral sentiment which needs only opportunity to display itself in emotion and volition in the directions in which it has its natural bent. The earliest circumstances of a person are very favourable for the development of moral emotion. A child under parental control is in just the condition to form ethical sentiments. The associations of early punishment are quite sufficient to generate moral approbation and disapprobation; and all the other associations are superinduced in the natural course of life till moral education reaches high degrees of perfection.

§ 95. *Love of Beneficence.*—This emotion, with its complement, hatred of maleficence, is a part of the moral approbation which we bestow upon the doing of good. Its character as an

emotion is strong in proportion to our constitutional predisposition and cultivation to and in the direction of aid to others. It is strengthened and made more frequently recurrent by a readiness to feel sympathy for those about us. Correspondingly, the hatred of the infliction of harm is large. But beneficence may go so far as to be practised to the detriment of mankind. Injudicious charities, for instance, encourage pauperism. In such a case we cease to have a regard for beneficence, and condemn it as a weakness, which excites our disgust and displeasure. The extent, then, of our love of beneficence is measured by the degree of utility which it comprehends.

§ 96. *Love of Fortitude.*—Under this head we have the emotions which attend our approval of courage, endurance, and the like. We have a large predisposition to sanction traits of character like these, irrespective of the utility which they subserve. The barbarian glorifies bravery which is displayed wantonly; the ancients of civilised nations often approved brute courage. But with the progress of civilisation there has been a growth of the disposition to honour courage and endurance only in proportion to the ends which they subserve. True courage is said to be opposed to recklessness. Wherever there is fortitude exhibited in a good cause, our approbation is attended with warm and hearty feelings of admiration, and often with personal regard for the one who endures. Pusillanimity, on the contrary, excites contempt and ridicule; but here also it must be observed that fear exhibited in the effort to avoid danger by facing which we could not accomplish any good purpose is not pusillanimity, but prudence. 'Discretion is the better part of valour.' Utility is hence noticeable in this case as a measure of our approval or disapproval.

§ 97. *Love of Prudence.*—By prudence we mean providence or forethought. This is so intimately connected with the welfare of communities and nations that the exhibitions of it we approve and the manifestations of its opposite fill us with painful emotions of many sorts, as anger, pity, grief, fear, according to circumstances. The qualifying test is utility again. If prudence is carried to the extent of penuriousness, niggardliness, and indifference to the welfare of those by whom we are surrounded, our approval ceases and disapprobation takes its place. Our appreciation of particular acts as prudent depends often on tradition and sentiment, but having its roots in a real or fancied utility.

§ 98. *Love of Truth.*—By truth in this connection is meant

not scientific truth, but moral truth or veracity. The maintenance of habits of true representation of things is so necessary to the preservation of social relations that we soon come from our own unpleasant experiences to abhor untruth and to value truth-telling. Our feeling when we contemplate untruth is of indignation, detestation, want of confidence, and impatience. We do not tolerate it, and we feel insulted when deception is practised upon us.

§ 99. *Love of Justice.*—When acts impress the mind as according to another what is due to him by reason of his character or deeds, we approve the same as just acts. The giving to another what is due to him is essential to all stability in the social system. Whatever thus favours justice meets with our praise; that which contravenes justice we deprecate. The emotions are of all degrees of strength, different in different persons, and varying with all the varieties of opinion as to what constitutes justice and injustice.

§ 100. *Love of Right and Virtue.*—The words *right* and *virtue* express the most general conceptions of what is ethically praiseworthy and blameworthy. An action is beneficent or just or courageous; it is also right and virtuous to whatever subordinate class it may belong. Right and virtue are grounded on utility and sentiment, and exhibit the most general forms of ethical emotion. Our love of these qualities and hatred of their opposites depend largely on personification. By our ideal constructions we can form images around which emotions of pleasure or pain gather, and to which associations of all sorts are attached. We may have a tender emotion in connection with an ideal construction which we term the right, and, as either by reasoning, or blind sentiment, or authority, we associate an object with our ideal, that emotion goes out with reference to such object. Our emotions of praise and dispraise of virtue are affected, too, by our religious emotions. A love to God is usually a strengthener of ethical emotions attending right and wrong; but yet everything depends on what associations form the idea of God. The ultimate character of all these ethical emotions depends on our idea of what constitutes virtuous and vicious action.

All these ethical emotions will receive further elucidation in connection with our exposition of volition, and still further when we come to examine the products of mental operation.

§ 101. *Subjective Emotions.*—Attending our own acts or con-

templation of those acts with reference to their consequences upon others and upon ourselves, ethical considerations affect materially our pleasures and pains. If we think of doing a beneficent, just, courageous, or generally virtuous act, where a course of education has created an appreciation of morality, we have a pleasurable feeling of conscious approval; the consideration of an opposite course awakens fear, anger, or other emotions apt to be distasteful and unpleasant, though not invariably so, but creating disapproval. Where, however, ethical training is deficient, or where bad habits have been indulged and the feelings of duty blunted, the emotions attending the thought of virtuous deeds may be wholly painful, while a vicious course is the attractive one and the one approved; and where there is a conflict between virtue and vice, it is always painful. All these subjective emotions may occur as relating to some future act, or to our past acts. They need not be enumerated or explained further. Two or three forms, however, deserve special notice.

§ 102. *Duty and Conscience.*—The feeling at the basis of the emotions of duty is fear. The apprehension of evil consequences, of punishment, is the essential stimulus in the creation of the sentiment. It does not, however, follow that our emotions of duty are always consciously tinctured with fear. Associations become firmly established, and the original cause is left out of the mind. In the state of mind which we term conscience, we are moved to approval or disapproval of acts contemplated by certain feelings, the chief of which is fear of consequences to result to us from acting as we consider contrary to our ideas of what is right. The feelings of conscience are strictly and properly the feelings attending disapproval. When we say our conscience approves, we mean that it does not disapprove. The origin of these feelings is in the submission to and experience of external authority, and their character is that of fear, their objects and occasions, however, being very various. Even where we are said to act from love, our conscience is emotionally only the fear of offending the beloved person. The love of God gives us a very tender conscience, our love for Him making to us the consequences of being thrown out of His approval appear the more terrible.

§ 103. *Remorse.*—Where an act of which we disapprove ethically has been done, the fear of consequences, which we consider must follow, induces and is the state of mind termed remorse. This fear is augmented in proportion to the hopelessness of defeating

and averting the threatened evil. If the evil to follow is slight and easily to be forgotten or effaced, the remorse is slight; but if the evil be great and there seems to be no way of escaping the consequences, no way of blotting out the wrong done, then remorse is terrible. This is the most purely emotional of all the states of mind which are connected with ethical sentiments. The state is one of black despair, melancholy inconsolable, mental torment. Indescribable when it occurs in its worst forms, it might well be taken as a type of ethical emotion. Where the consequences apprehended from an evil course are chiefly physical, when they begin to be felt in depression or sickness, the remorse is great, but the emotion abates in intensity when there is a rallying or recovery.

> 'The devil was sick, the devil a monk would be;
> The devil got well, the devil a monk was he.'

Where the results to be apprehended are effects upon character, the remorse varies as the power of recovery. Where there is a belief that a single lapse from virtue never can be wholly made good, the remorse is peculiarly stinging. When the displeasure of an offended God is the object of fear, the death-bed exhibits the most fearful examples of remorse of which we have knowledge, for there the hope of recovery and expiation is removed by the certainty of speedy death.

§ 104. *The Ethical and the Æsthetic.*—There is an æsthetic interest about ethical emotions generally which should be observed. It has been noted already in connection with beauty of character. The manifestation in others of those traits which command our approval ethically may also have an æsthetic interest. But that which evokes our ethical disapprobation would not be æsthetic unless our selfish regards triumphed over our ethical feelings; sin may sometimes be æsthetic, but not if our ethical disapproval is a very controlling emotion. Of ethical emotions connected with one's own acts or states of mind, the emotion of duty not infrequently has an æsthetic colouring. Of course a condemning conscience or remorse would prohibit æsthetic feeling. But whatever the connection of æsthetic with ethical emotions, or however the one may be superimposed upon the other, the two classes must not be confounded, for they are radically distinct in their nature.[1]

[1] Cf. Bain's *Emotions and Will*. See also note p. 301.

CONCLUDING REMARKS.

§ 105. No pretence is made that the foregoing sections of this chapter either exhibit all the varieties of emotional development or exhaust the delineation of those varieties which are spoken of. On the contrary, my effort has been to say as little as was consistent with a tolerably adequate presentation of the subject. What has been said, however, will, I trust, show the principal sources of emotional states, the leading groups of emotions, together with the general course of development. Taking all this, with the detailed illustration of pleasures and pains reserved for a subsequent Part (VIII.), I hope I shall have succeeded in giving a reasonably complete account of states of consciousness on the side of feeling, an aspect too much neglected by psychologists hitherto.

§ 106. On reviewing the exposition in this chapter, the reader will readily observe that our entire emotional development is subservient to the development of life, and occurs in furtherance of that continuous adjustment of inner to outer relations of which life consists. There is a constant communication between the organism and its environment in introsusceptive or repulsive action; and out of the necessity for selective introsusception grow the egoistic feelings which, elaborated by representation and integration, become guides to our action in the direction of self-maintenance and self-preservation. The advantages of gregariousness in securing co-operation for ends of self-preservation and the impulses toward reproduction, through which the evolution of the race proceeds, give birth to ego-altruistic and altruistic emotions, which have gradually developed into all the sympathetic, social, and moral sentiments which identify individual welfare with the good of the race.

§ 107. Thus our emotions are differentiated from appetitive feelings. Self-preservation seems to have been the first law, but the exhibition of some degree of altruistic feeling must have existed wherever there was co-operation and sexual interest. But the peculiarity of development has been the widening of the circle of altruistic regards, in the course of the evolution of mind. The establishment of the consciousness of organic connection which altruism implies, in the earliest form extended only to one other or two or three, and was not lasting, since representation was weak. Altruism, then, was limited to the family or its equi-

valent, and there it subsisted only temporarily. It grew to include the neighbour for the time, or perhaps extended to the tribe. Small societies thus came into being, in which altruism was maintained to a greater or less degree. Afterward communities, states and nations created cohesions which further widened the limits within which altruistic regards worked. Finally, there dawned on the world the idea of the organic unity of all mankind, which in the human race is the highest stage, and which is made the basis of Christian ethics. In the lower animals we observe the same course, though not the same extent of development. In conclusion, let us observe again that the whole course of emotional development proceeds concomitantly with and is indicated by the development of cognitive redintegration.

END OF THE FIRST VOLUME.

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